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ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER

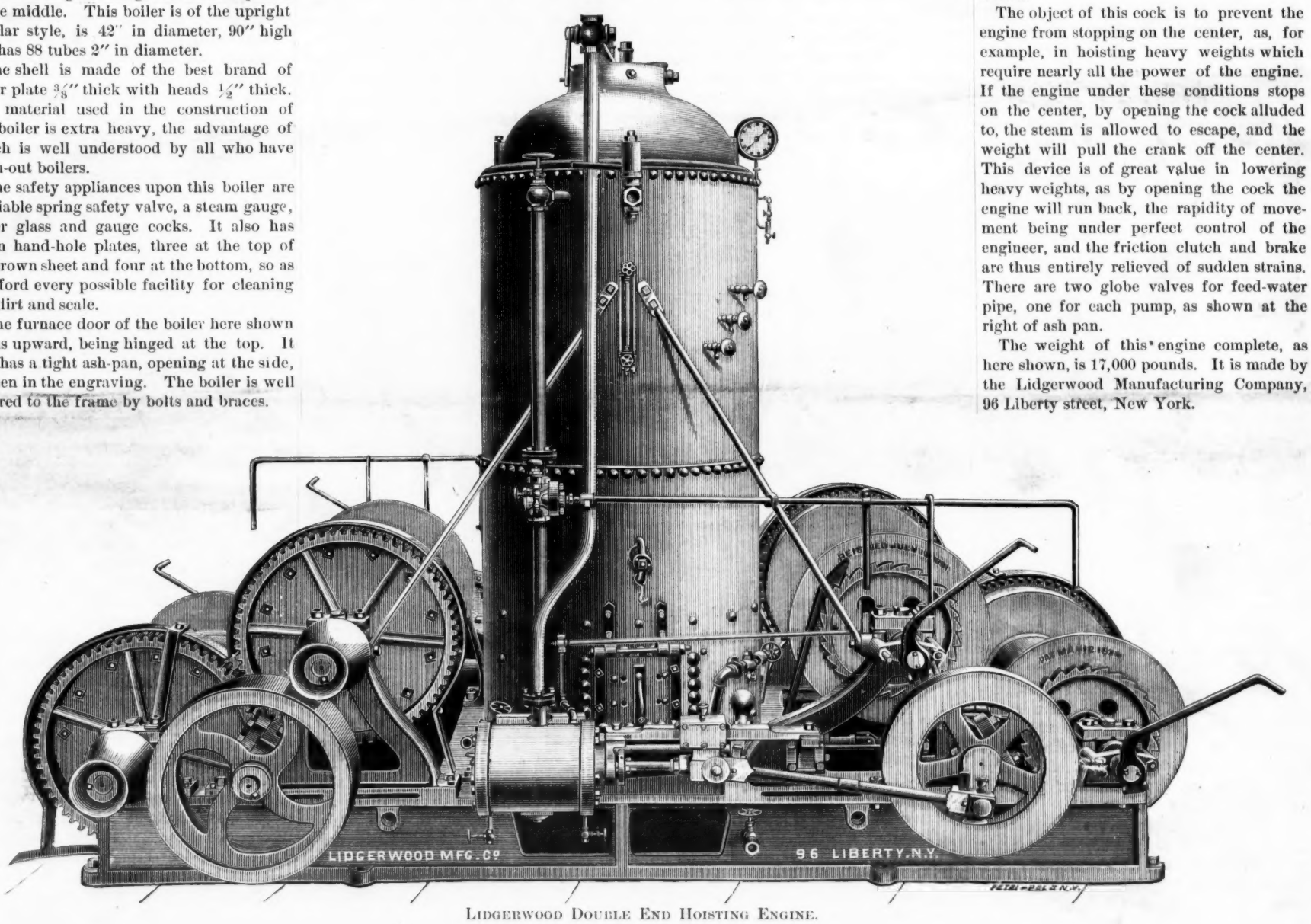
Lidgerwood Double End Hoisting Engine.

The hoisting engine shown in the engraving on this page consists of two separate engines, with drums and other appurtenances, all attached to one bed-plate. This bed-plate is 5 feet wide and 10½ feet long, being composed of a single casting, with a boiler placed in the middle. This boiler is of the upright tubular style, is 42″ in diameter, 90″ high and has 88 tubes 2″ in diameter.

The shell is made of the best brand of boiler plate ⅜″ thick with heads ½″ thick. The material used in the construction of this boiler is extra heavy, the advantage of which is well understood by all who have worn-out boilers.

The safety appliances upon this boiler are a reliable spring safety valve, a steam gauge, water glass and gauge cocks. It also has seven hand-hole plates, three at the top of the crown sheet and four at the bottom, so as to afford every possible facility for cleaning out dirt and scale.

The furnace door of the boiler here shown opens upward, being hinged at the top. It also has a tight ash-pan, opening at the side, as seen in the engraving. The boiler is well secured to the frame by bolts and braces.



LIDGERWOOD DOUBLE END HOISTING ENGINE.

The engine cylinders are 8¼″x10″. The details of these engines were described in the AMERICAN MACHINIST of Sept. 2, 1882.

It will be observed that in this style the single engines are placed at opposite sides of the boiler, and are to be operated independently. Each engine has two drums, which have either plain or grooved faces as desired. The mechanism for starting and stopping the drums is in the form of a friction clutch. The inner surface of the large gear, keyed to the shaft at the end of the drum, has wooden segments bolted upon it, with the grain of the wood running radially from the center. This wood is of the hardest kind, being well seasoned hickory. The inner ends of each block abutt against the hub, and the edges are neatly fitted together so that when they are all in place they are practically equivalent to a solid wooden face. Outer ends of the blocks are beveled off to fit a recess of a similar shape in the end of the drum. As the drum is loose upon the shaft, it is moved endwise to and from the wooden face upon the gear, so that the friction is positive. The surfaces in contact being one of wood and the other iron, the wear is very slight and there is no tendency to heat and thus destroy the surfaces.

The mechanism for moving the drum endwise consists simply of a handle at the end of the shaft, within easy reach of the engineer, connected by a clamping device to a screw fitted through a cross-bar at the end of the shaft. This screw presses a steel pin in the end of the shaft, and communicates end motion to the shaft by means of a collar and cross-key. It will thus be understood how a very little pressure upon the handle will hold any weight that the engine is capable of hoisting.

The surfaces of the friction clutch are proportioned to the size of the cylinder, and will last for many years, with good care.

This engine was designed to set between two derricks, so that they may be operated independently. The upper drum is used to hoist the weight, while the lower drum raises and lowers the boom, which carries the weight nearer to, or farther from the mast.

If it is desired to hold either the weight or boom in any permanent position, this may be easily done by throwing the catch into the ratchet at the end of the drum, as shown upon the upper drum of the right-hand engine.

The drums each have a winch upon the ends of their shafts, as shown upon the left-hand engine, which are to be used whenever occasion requires. These winches are of special value in hauling or moving stone, or other heavy weights. Each of the engines also has a band-wheel upon the end of its shaft, for the purpose of applying a belt to drive rotary pumps or other machinery, as may be desired. The engines are not reversible, and when desired a foot brake may be attached, to act upon the face of the disc crank. This arrangement is preferred by some who still insist upon working in the old way, and to save the friction wheels where there is a great deal of lowering to be done. This engine can be handled with great ease, the throttle having two handles, as shown, so that the engineer, in handling either drum, can easily reach one of the handles for the throttle.

Each engine has a feed-pump worked by an eccentric upon its shaft. These pumps are independent of each other, thus enabling the engineer to feed the boiler with either engine, or in case one should fail when he has not time to repair it, there is one reserve pump to fall back upon. The exhaust pipe is provided with a three-way cock, so that the exhaust steam may be turned into the air or into smoke-stack as required. A small pipe is tapped into the steam-chest having a plug cock at the end. This cock is operated by a handle within reach of the engineer, as shown.

The object of this cock is to prevent the engine from stopping on the center, as, for example, in hoisting heavy weights which require nearly all the power of the engine. If the engine under these conditions stops on the center, by opening the cock alluded to, the steam is allowed to escape, and the weight will pull the crank off the center. This device is of great value in lowering heavy weights, as by opening the cock the engine will run back, the rapidity of movement being under perfect control of the engineer, and the friction clutch and brake are thus entirely relieved of sudden strains. There are two globe valves for feed-water pipe, one for each pump, as shown at the right of ash pan.

The weight of this engine complete, as here shown, is 17,000 pounds. It is made by the Lidgerwood Manufacturing Company, 96 Liberty street, New York.

The Baltimore and Ohio Railroad is using coke as fuel for its engines running between Chicago and South Chicago, the object being the avoidance of smoke. Connellsville coke of the best quality is used, and the entire run can be made without touching the fire. No smoke is emitted, but an odor of sulphur is noticeable.

The Master Car Painters' Convention met at Chicago, September 20, and remained in session three days. The society has a membership of eighty-four, an increase of fourteen over last year.

During the meeting the shops of the Chicago and Northwestern road and the Pullman works were visited by special invitation.

Experiments are in progress with a view to the use of coke in all the passenger engines of the Pennsylvania Railroad to avoid dirt and smoke.

Indicated vs. Effective Horse Power.

By F. F. Hemenway.

In the buying and selling of steam engines the question naturally arises: Of what interest to the buyer is the indicated horse power? In selling an engine the buyer is particularly interested in getting one that will accomplish a certain amount of *useful* work, in turning the wheels in his shop or factory, and not any further than it costs fuel and represents the condition of wearing out, in the useless work of friction. The question—sometimes a serious one—between seller and buyer, whether a certain stipulated power means indicated or effective power ought never to arise, since the latter expresses exactly what the buyer wants to know in connection with his work, and to it should be referred the measure of economy with which he can do that work.

The buyer is not interested in tests going to show the economy of an indicated horse power, although he is frequently misled by statements of efficiency calculated from this basis. Were the power expended in overcoming friction always proportionately the same in different engines, it would be better than it now is to accept their rating per indicated horse power, but, as is well known to engineers, one engine may waste 30% of its indicated power in friction, and yet measured by the indicated power show better economy than another that utilizes 90% of its indicated power. Measured by the effective horse power, the only consideration that properly appeals to the user, the apparent superiority in point of economy of course disappears.

But even if the friction were the same in engines from different builders, rating by indicated horse power for economy would not be right, because an engine somewhat too large for the work would then show an apparent economy greater than one of just the right size; besides the difficulty is still in the way that the user knows nothing about an indicated horse power in connection with the requirements (in the way of power) of his machinery.

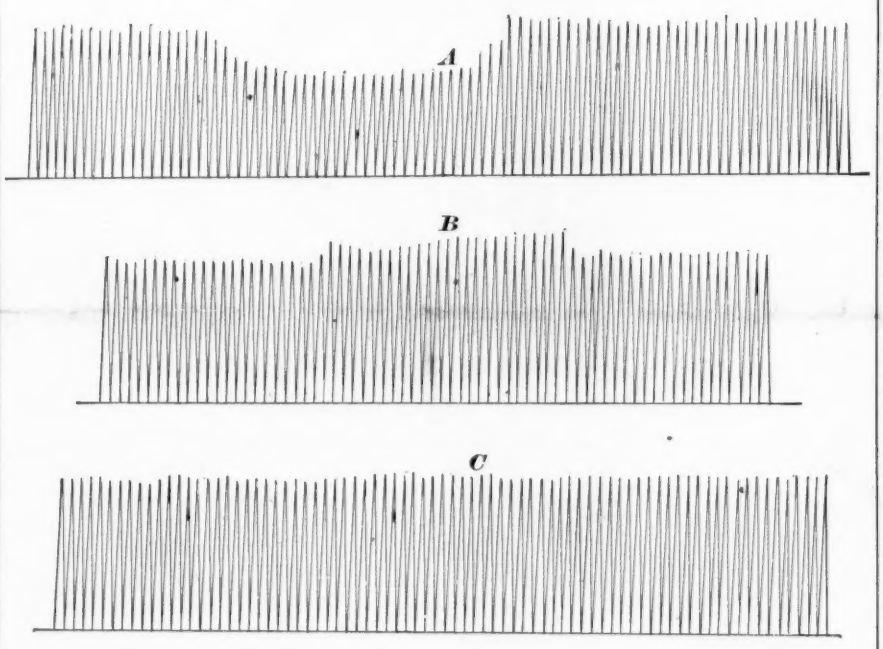
The custom of rating engines by their indicated power obtains, chiefly from the fact that it is comparatively an easy matter to measure power by the use of the indicator, but there are legitimate uses enough for this indispensable instrument without bringing it into bad repute by assuming it will do what it will not do.

Since a man buys a useful machine for the quantity or extent of its utility, this quality alone should be the prominent factor in the transaction of buying and selling, instead of some other quality more easily measured, but scarcely pertinent to the question of value. Buyers of steam engines should always buy on the basis of effective horse power, and should insist on the economy rating being on that basis.

It would be of great service if means were provided for the more accurate measuring of the effective power of the steam engine. This would not only tend to simplify matters between the buyer and the seller, but it would also tend to the further improvement of the steam engine.

A Want.

We heard, one day recently, a well-known engineer express a desire for a revolution indicator, to be used in the end of a shaft like the little instrument at present so extensively used for this purpose, but which should be more accurate in its indications, or, rather, which should permit the user to make observations that were substantially correct. His opinion of the present counter is that, using it in connection with a watch upon which the time must be noted, is fatal to accuracy, since the personal equation of the observer should be taken into account, which in the case of an engineer, or a man vexed with many and various cares, is scarcely twice alike. It would follow, then, from this presentation of the case, which is unquestionably correct, that in making observation of the revolutions of a shaft in the ordinary way, the observer will never make it absolutely correct; that two observers will not make it the same; and that the same observer, ordinarily, will not make it alike (in the extent of the error) two days in succession. A valuable suggestion of this engineer is, that with the present indicator should be combined a time movement, capable of marking time correctly for, say, two or three minutes, the whole so arranged that by applying the end of the spindle to the center in the shaft (just as at present), after allowing sufficient time to insure the motion of the two being identical in time, the counting and time motions can be simultaneously engaged, and automatically and simultaneously disengaged at the expiration of a definite time—perhaps one, two or three minutes, as desired. A glance will then show the exact revolutions without the possibility of sensible error. The advantage of some such device as this, where, as is becoming more and more common, it is advisable to determine the *exact* revolutions of quick-running machinery, is beyond question, and it would not seem to be a serious undertaking to construct a simple and effective arrangement of the kind—one that would be both mechanically and commercially a success. Since the present intention is towards perfection in all instruments of observation, it is time our tool-makers gave us something by which to correctly observe the revolution of machinery.



The American Institute Fair.

The city of New York has for many years had no other industrial exhibition than the one annually given by the American Institute. This fact has undoubtedly caused the management of these fairs to become in a measure indifferent to public complaints, whether well founded or not. Gradually the annual fairs have declined in mechanical interest and value, and the bazar feature has expanded until manufacturers of the best machinery and tools are reluctant to send their products for exhibition. Still the fairs are visited by large numbers of people every year, giving evidence that a live and progressive mechanical exhibition at the metropolis of this country would not lack substantial appreciation.

At this writing the American Institute Fair has been open a week, yet hardly more than half the space devoted to machinery is occupied. Heretofore admission tickets have been sold in packages of ten at 25 cents each, but this year the full 50 cents admission is required, no matter how many tickets are purchased.

Many articles occupy the same location year after year without change. The building, however, does not indicate anything like permanency, as it presents a rather rough, unfinished appearance. A coat of whitewash has been applied to the ceiling of the art gallery to lighten the artistic effect. Two things strike a visitor favorably: The building is well illuminated by the U. S. Electric Light Co.'s lamps. Their dynamos are driven by a Westinghouse high-speed engine, and the lights are very steady and clear. The other favorable feature is the good band which discourses excellent music.

The exhibits of machinery are of good quality, but are placed at a disadvantage by reason of the general thinness of the fair. E. E. Garvin & Co., 139 and 141 Center street, New York, show several of their well-known milling machines and drill presses. E. W. Bliss, Brooklyn, New York, has one of his 20-inch swing engine lathes at work. This lathe was described with a cut in our issue of December 3, 1881. Mr. Bliss also shows a new 36″ squaring shear for sheet metal which cuts very neatly without leaving a ragged edge, also three punching presses. A novelty in the way of a punching press is shown by the Howard Patent Metallic Brush Company, 48 Washington street, Boston. The die is operated by a friction clutch which takes hold instantly when the treadle is worked. It is very rapid in action, and seems to possess an advantage over the single clutch press. A line of Korting's injectors and steam engineering appliances are shown. They embrace some particular improvements which have been added during the past year.

Parsons Hand Rock Drill Co., 115 Broadway, New York, show a novel rock drill, and allow visitors to try how easily it works. It is worked by two levers which actuate springs. The latter deliver the blows upon the drill. The machine is small, works at any angle, and seems to be quite effective. Robert Whitehill, Newburgh, N. Y., has a horizontal engine driving part of the machinery, and several engines of the New York Safety Steam Power Co. are about being placed in position to run.

Aside from mechanical exhibits, the fair is very much like a bazar. As the visitor walks along the aisles he passes piles of flour barrels, canned fruits, packages of soap, oleomargarine, and other merchandise, which afford no other information of their peculiar qualities than is obtained by inspection of the labels. An attractive young lady solicits the passers by to swallow a sample of Seidlitz powder, while the venders of soap for removing grease spots busily ply their fingers and tongues to impress the merits of their wares upon prospective customers. The dealers in tooth powder, perfumery, flowers, candy, sweet cider and other notions, are also very active, and apparently do a thriving business.

The Holley Memorial Fund.

We are informed by the treasurer of the Holley Memorial Fund, Charles Macdonald, 52 Wall street, New York, that the subscriptions to that fund thus far amount to $3,335, being about one-third of the amount to be raised to erect a monument to A. L. Holley in Central Park. In a future issue we will publish the names of the subscribers. As the object of the subscription is a public one, we see no reason why the list of names with amount contributed by each should not be sent at intervals to all prominent daily and weekly papers, in order that wide publicity may be given to the movement and the full amount raised promptly. The committee of three in charge of the matter named, request the American Machinist and two other journals to publish the list of contributors from time to time. This was a surprise to us, as we do not favor any such exclusiveness. Other journals should be furnished with the list with equal promptness.

The Ball Steam Engine Governor.

When Watt first applied a governor to his steam engine he found it to contain a very serious and inherent defect. Although intended to control the engine and maintain uniform speed, it was only a partial success, because it was dependent entirely on variations of speed for its power to act on the steam supply. Hence the very irregularities of motion in the engine which it was intended to obviate, had to occur in a greater or less degree, before the governor could act. As a result the engine was not kept at uniform speed under changes of load, but only kept within certain limits of variation.

All the years of thought on this subject since Watt's first efforts, have only served by improved mechanism and reduced friction to modify this defect; the same defect, in nearly the same degree, exists in all governors to-day.

If a governor were only called upon to shut off steam when a certain speed was reached, and to turn it on again as soon as the speed fell below that point, this range of variation could be made reasonably small; but shutting steam off and turning it on again is not governing an engine. It is not enough that the speed shall *average* right, for this intermittent supply of steam would not only be fatal to economy, but very disastrous to the engine and machine, and in many cases would ruin the work being done.

It has been found necessary for the governing mechanism to be capable of taking intermediate positions, with considerable stability, to secure a uniform and necessary supply of steam. To give this stability, all successful governors have been so arranged that as the governing mechanism moves to vary the steam supply, it constantly meets with increased resistance, requiring an additional change of speed to move it further, so that the total variation between "entirely empty" and "full load" is very considerable. This is well understood to be a fact, and among governor builders, each one claims to have reduced this variation to a smaller limit than any of his competitors.

The text-books speak of this defect in governors as an inherent one, leaving a loophole, however, by saying that it *seems* to be unavoidable. Experience teaches that it is never safe to be sure a certain thing cannot be accomplished.

The engravings presented herewith, represent a governor in which the effort has been to eliminate the defects previously referred to, the speed diagrams being appended for the purpose of demonstrating how nearly the end has been accomplished. This governor has just been brought out by the Ball Engine Company, of Erie, Pa., being designed by F. H. Ball of that company.

Its distinguishing feature is the employment, in a novel way, of the *effort of the engine*, which is transmitted by the governor, and is intended to act in such a way as to correct the heretofore unavoidable defect of the governor. The engravings show this governor as constructed to automatically control a single valve engine.

The main eccentric has an oblong shaft opening, and swings across the shaft with a pendulum movement, as is common with most single valve automatic engines. It is moved or swung by the action of another eccentric, mounted on the shaft by its side, the ring of which engages a stud projecting from the side of the main eccentric. It will be seen that the oscillation of this secondary eccentric forward and backward, causes the main eccentric to swing across the shaft, which action controls the admission of steam in the usual manner with this class of engines. This secondary eccentric has a sleeve surrounding the shaft, and projecting

through the oblong hole in main eccentric, and screwed thereon is a nut which covers the oblong hole and keeps the main eccentric in contact with secondary eccentric.

The oscillating motion spoken of is caused by the combined action of weights and springs, communicated through the ball and socket joints on the outer side of secondary eccentric.

In Fig. 3 the eccentrics are detached, and are shown inverted in Fig. 4, which shows the manner of connecting with ball-and-socket joint.

Fig. 1 is a view of governor from outside of engine.

Fig. 2 is a view from inside.

It will be seen that the centrifugal force of the weights is opposed by springs in the usual way, and the result of these forces is communicated to the eccentric by which the governing is effected. So far, we have, practically, the usual form of governor with the same old defects. To correct these defects, the driving or belt pulley is made to form a part of the governor, and is mounted loosely on the hub of an arm which is keyed to the shaft.

The extremities of this fixed arm have studs, on which are pivoted levers having one end attached to the weights and springs, and the other end connected with the rim of the driving wheel, forming the means by which the wheel is driven. With this arrangement the load is constantly being weighed by the governor, and any change of load is immediately recognized and acted upon by the governor. The weights and springs furnish the necessary stability, and the load force is only used in sufficient quantity to bring about the changes of steam supply without the necessity of change of speed.

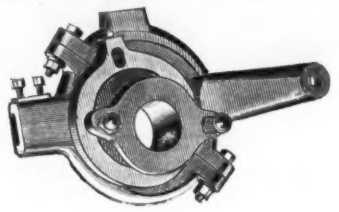


Fig. 4.

A very ingenious indicator was used to produce the speed diagrams which we publish as a record of the practical workings of this governor. A weight was suspended in the balance-wheel, with a spring to oppose its centrifugal force. During one-half of each revolution gravity drew the weight toward the center, and when in the opposite position gravity drew it away from the center. The result was a constant vibration, corresponding with each revolution of the engine. This motion caused a pencil to move up and down before a revolving paper cylinder, making the diagrams as they appear, in which the length of each line indicates exactly the rate of speed for that revolution.

The engine on which this device was used was made to drive a wheel submerged in water, and so arranged that it could be lifted out or submerged with the engine in motion. The engine was also arranged to be under the control of the new governor, or at pleasure to be controlled by one of the usual form of governors—one which deservedly stands high as to excellence of performance. Diagram *A* (page 2) was taken with this governor, and is the best sample that could be obtained. Diagram *B* was taken with the new governor. In all the diagrams the load was suddenly thrown on before reaching the middle of diagram, and as suddenly thrown off in the latter part of diagram. It is very evident, in diagram *A*, where the load was met and where released; diagram *B* furnishes no evidence of these points. A slight disturbance in the early part of diagram may have been caused by the shock of the load; but it cannot be known from the diagram where the load ceased.

Diagram *C* is given as a curiosity, and to illustrate the capabilities of this governor. In this case the governor was adjusted to accelerate the speed of the engine under load, and the duration of load is clearly marked by acceleration of speed. This is certainly a phenomenon in the performance of steam engine governors, and would seem to demonstrate that the matter of relative speed between "loaded" and "unloaded" is under control.

We understand that the Ball Engine Company have several engines, fitted with this governor, now in use.

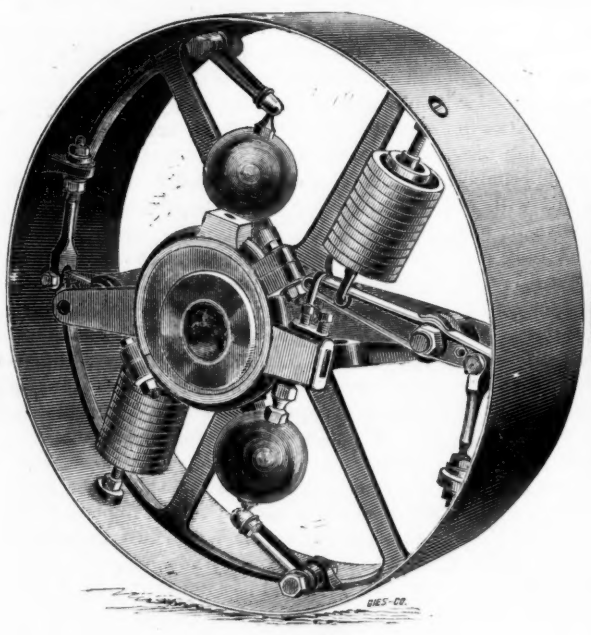


Fig. 1.

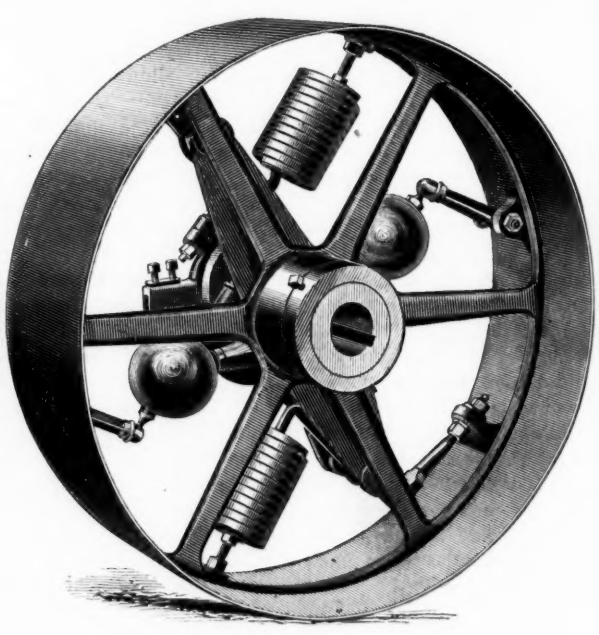


Fig. 2.

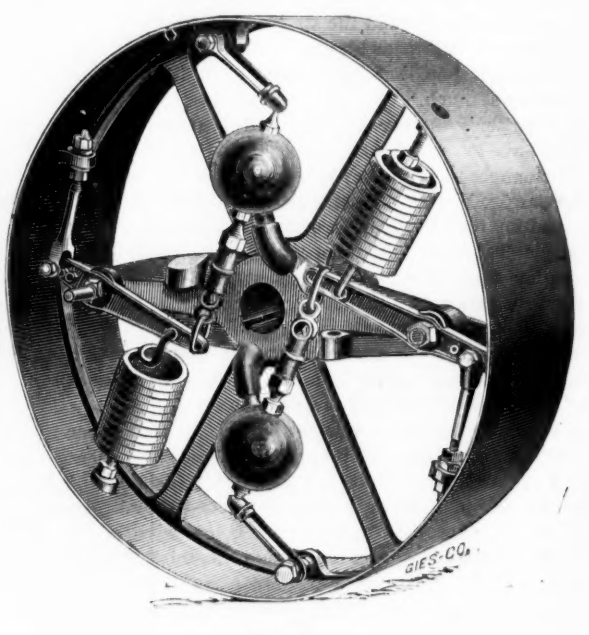


Fig. 3.

"Controlled Combustion."

Recently there has been incorporated under the laws of the State of New Jersey, a company known as the "Control Combustion Company," the objects of which, as set forth in one of their publications, is "to equip locomotive, marine, and stationary boilers with the appliances required for 'Controlled Combustion,' and also to license this right to other companies." The inventor of this system, E. J. Mallett, Jr., proceeds on the assumption of an enormous loss of fuel under the present practice, which he proposes to remedy by means explained in his and the company's publications.

In the boiler as constructed by Mr. Mallett, a special feature is the production of a draft by means of an exhaust fan, which constantly operates to exhaust the products of combustion. The supply of air to the furnace being under control, it is by this means possible to keep the pressure or tension of the air, &c., surrounding the fire, less than that of one atmosphere; a condition for which it is claimed that only the exact supply of air to furnish the required amount of oxygen need be admitted, and also that the perfect combustion of everything combustible results, thus entirely doing away with smoke, and rendering a chimney superfluous.

For regulating the air supply, in a stationary boiler, for instance, the ash-pit doors are fitted with a register which can be entirely, or to any extent closed, and hollow grate-bars open at their ends are used, the external openings leading to which are provided with a damper. This furnishes means for entirely closing the furnace against the admission of air. A wall, which in ordinary boiler setting corresponds to the bridge wall, separates the furnace proper from the combustion chamber. This wall is built entirely up to the boiler, but is perforated for the passage of the furnace gases, the object being to compel the passage of these gases through the wall near the rear openings of the grate-bars, which latter extend entirely through the wall, to the combustion chamber beyond.

In operation, after freshly charging the furnace, the ash-door dampers are closed, thus excluding air from the furnace proper, the gases in the fuel being evolved by the heat of the incandescent coal on the grate. The dampers controlling the passage of air through the hollow grate bars are open, and the gases passing through the perforations in the dividing wall are met by the heated air passing through the grate bars, resulting in combustion in the combustion chamber. By properly manipulating the two sets of dampers—those of the ash-pit doors and those of the grate bars—it is claimed that just the requisite quantity of air may be admitted, in the proper way and place, to insure perfect combustion of both the solid and gaseous constituents of the fuel.

The heated products of combustion, before reaching the exhaust fan, are passed through an "Athermous Superheater," just previously to which they are moistened to saturation by a water spray. In the superheater they are made to heat the feed water, it is said, to the temperature of the water in the boiler, and are finally allowed to escape at a low heat.

It would seem that the only really novel feature of this arrangement is the employment of the exhaust fan to create a draft, with the resulting low tension in the furnace, there being, so far as is shown, nothing in the other features that has not at different times been advocated or put into practice in an analogous, if not in the precise, manner here done.

Of the probable economy of the system, it is too early to speak. An experimental boiler has been operated for some time in this city, and Mr. Mallett is reported as saying that the results demonstrated a fuel saving of over 45 per cent. We are inclined, however, to think that this claim, taken in connection with some of the statements in one of his publications, is hardly a happy one, as it would go to show that the boiler upon which the tests were made was, when working previously to the alteration, hardly in proper condition to be tested. The statements referred to are the quotations made, and to all intents endorsed, from tests of B. F. Isherwood; some of which tests show the utilization of more than 80 per cent. of the heat value of the fuel used. With a boiler as well served as the one in Mr. Isherwood's experiments, there would be less than 20 per cent. lost, upon which to effect a saving of 45 per cent.

In showing the advantages of any novel system, justice to the inventor as well as to others would seem to demand that a comparison be made with something representing at least fairly good practice, and the Control Combustion Company will experience no difficulty in finding plenty of manufacturers of boilers who will guarantee a duty that will leave materially less than 45 per cent. upon which to predicate or demonstrate a saving, unless it can be shown that considerably more can be saved than is lost. Altogether, the assumptions upon which the saving of fuel are based by Mr. Mallett are not, especially when taken in connection with the tests published by him, such as to inspire perfect confidence, and much more remains to be practically demonstrated before they are entitled to be taken as established facts. Particularly the published and certified statements of boiler efficiency must be shown to be wrong, or the statements of the economy of this system must be modified.

It is a fact well known to engineers that fuel is often extravagantly used—wasted—in generating steam, but it is quite as well understood that means for diminishing this waste are as well known, though employed only to a limited extent. If Mr. Mallett has devised means equal in efficiency to those already known, he has still to demonstrate that they are cheaper or simpler before he can hope to bring about their general adoption. If, in addition to their being cheaper or simpler, or both, he can satisfactorily demonstrate that they are more efficient, his accomplishment will be the greater.

National Society of Stationary Engineers.

Editor American Machinist:

Will you kindly insert the following in the next issue of your paper, and oblige the following delegates: To all Stationary Engineers' Societies in the United States. The undersigned delegates to the Convention to organize a National Association of Stationary Engineers in the United States, would request you to send one delegate to the Convention to meet in Pythagoras Hall, No. 134 Canal street, New York City, on Wednesday, October 25th, at ten o'clock, A. M.

Signed,

Henry D. Cozens,	Delegate,	Providence, R.I.
James Canning,	"	Brooklyn, N. Y.
A. M. Davy,	"	Detroit, Mich.
Arthur G. Hounsell,	"	New York City.
George M. Barker,	"	Boston, Mass.
George A. Grover,	"	Boston, Mass.
J. F. R. Cullinan,	"	Rochester, N.Y.
One delegate to be elected 6th inst.	"	Lynn, Mass.
William Ponsonby,	"	Chicago, Ill.
A. H. Goff,	"	St. Louis, Mo.

And others.

Uncle Peter's Remarks.

REPORTED BY "THE BABY."

"What a blessing it would be if some of these men that have so much money they are anxious to give it away, would only organize some kind of an institution to teach the average inventor how to draw. Now, there's that Bushy, been working around here cutting and trying for about two years. He's spent four or five thousand dollars on that thing and hasn't got anything yet, just because he can't make it himself, and can't draw it out so that some one else can make it for him. Piles of money are thrown away every year, for the reason that men can't learn to experiment on paper. Young man, you'll find that the biggest half of the machinist's trade can be got, in humping your back over a drawing-board.

"Do you know what the reason is so few machinists ever amount to anything? Why the reason's plain enough. They learn every bit of their trade in the shop. Now, for example, let's compare two of the apprentices we took in three years ago; Smith and Walton, for instance. Both boys have had the same chance. Smith waits to be told everything; never anticipates, never advances any idea. Prompt enough in the morning, but just as prompt to get away at night; shuts off his machine just as soon as the whistle blows, starts home, swallows his supper, changes his clothes, and you can see him any evening loafing around the streets with a lot of just such fellows as himself. He *works* in a machine shop, but he'll never learn the trade—not much.

"Walton's mother is poor, and I guess they have to scratch to get along; but I see he manages to get money enough to buy the AMERICAN MACHINIST—and he reads it, too—and not only that, but he's borrowed every mechanical work in the place, and can give you an idea of every mechanical process, from the action of a hammer to the working of a Jacquard loom. He's taking drawing lessons now, and though he'll never make a fine draughtsman, when he makes a drawing of a machine it will work, every time. Why, he's got up the best screw-cutting system I ever saw. He explained it to me in this way: If he wants to cut a thread, say 9, for instance, he just draws a line and sets the pitch of the screw he wants to cut below it, and the pitch of the lead screw above it, this way:

lead to be cut $\frac{4}{9}$ | goes on spindle, goes on screw.

Now, he says, if you multiply these two numbers by any number, it will give you a pair of gears that will cut the thread you want every time. Say you multiply by six, you'll have twenty-four for your spindle and fifty-four for your screw, and that's the best thing in the shape of a screw-cutting system yet. He never gets stuck, but seems to anticipate every mean job there is to be done, and he can do it some way. He's no one idea crittur, but has several ways to do the same thing. When Smith's running a lathe for three dollars a day, Walton will be superintending some big shop, and telling a whole lot of Smiths how to do things they say can't *be* done."

Here Uncle Peter left me to my own reflections, which were to the effect that sometimes it is a good thing to be so left.

A correspondent of the Cincinnati *Commercial*, traveling in Germany, gives expression, among other things, to the following personal observations:

The most magnificently-disciplined standing army in the world is maintained at a cost which cannot fail to tell on those people in the years to come. The men are drawn off to fight, and the women do the men's work. At this day in Germany women blacksmiths are not very uncommon. What is to become of the refinements of social life, the sweet sacredness of home?

* * * * *

Everything hereabouts, too, seems done by sheer brute strength. There is no saving of labor, either by machinery or by the application of common sense. In the field we saw no American agricultural machinery, as in England and Scotland. Where in America a load of baggage, trunks, valises and boxes would be piled high upon a dray or great truck, and transferred at one gulp for short distances, here your porter takes it upon his head or arm, as the case may be, and lugs it off slowly and painfully, one piece at a time. We have had more fuss and trouble to keep from losing our baggage, coming from London to Cologne, than we should have had at home in going from New York to San Francisco and back again.

New Die Stock for Gas Pipe.

The accompanying engravings represent: Fig. 1 a front view, Fig. 2 a back view, and Fig. 3 a cross section of a new die-stock made by Forbes & Curtis, of Bridgeport, Conn. Referring to Fig. 1, it will be seen that this stock can be fastened to a bench or

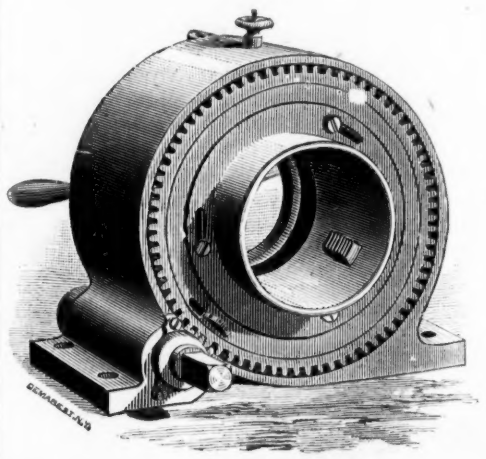


FIG. 1.

to a plank mounted on horses or other convenient support, by the feet shown—in other words, that it is self-contained, requiring no separate vise or its equivalent.

The pipe to be cut is held in the jaws of the chuck, shown at the back of Fig 2. This chuck is simply made, the jaws being fitted with cast-steel hardened faces, which can be replaced at any time at a trifling expense.

Instead of a solid die, bits are used, which can be taken out and sharpened by grinding, the time required to do this being but a few moments. When the pipe is threaded, these bits fold back and out of the way, thus permitting the pipe to be removed without the necessity of running back, and what is equally important, saving the wear and breaking in running backward.

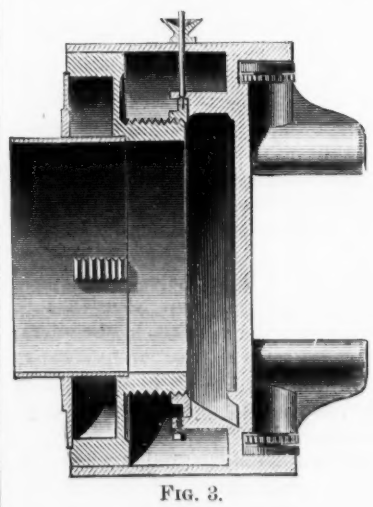


FIG. 3.

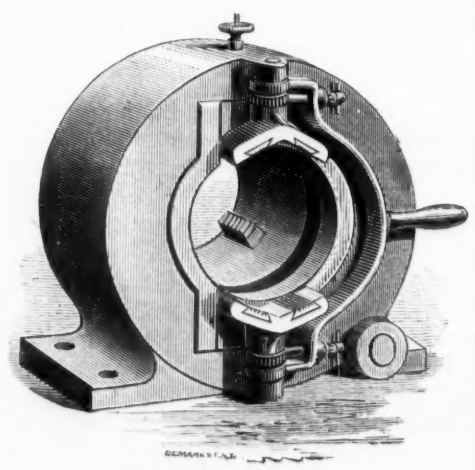


FIG. 2.

One size of this stock is made to cut either right or left-hand threads on from 1" to 2" pipe; all the changes necessary being to change the bits and lead screw-ring, the whole requiring but a moment.

In the instance of the occasion to thread the end of a pipe in position and in a confined place, as in the ground, it can be readily done with this stock, as the stock can be operated in any space where a man can work.

On large sizes a cut-off attachment is supplied, which is very convenient for many purposes.

The large gear is cut from the solid metal as well as the pinion, which is of steel.

Although these stocks are strong in their parts, they are yet light and conveniently handled. They are made in three sizes, to thread pipe up to 6" in diameter, it requiring but two men, we are told, to easily thread 6" pipe, and but one man or a boy to thread 4" pipe.

An Essay on Safety Valves.

FROM THE HARTFORD BOILER INSURANCE COMPANY'S "LOCOMOTIVE."

It seems strange that in the present advanced state of the mechanic arts, there can be found men who will fit up safety-valves in the manner in which we sometimes find them. In many cases the grossest ignorance of the first principles which should govern the construction and arrangement of apparatus of this sort is displayed. In other cases it would be hard to determine whether ignorance, carelessness, or cupidity is responsible for some of the astonishing work which we run across.

One favorite way of running the escape pipe of a safety-valve where boilers are situated in buildings not over one story high, is to run it straight up through the roof of the building. This is perhaps well enough if the connections are properly made and the pipes properly drained, but unless they *are* furnished with a properly arranged drip-pipe, the arrangement is positively dangerous, and should never be allowed under any pretense whatever. In fact no escape-pipe should *rise* in the slightest degree after it leaves the valve-chamber without being provided with a drip-pipe. It will invariably fill with water if it does, and this will, of course, increase the load on the valve, and the water which so collects, not only corrodes the valve and its fittings, but it is very liable to become frozen in the winter season, and disaster is sure to follow if it does.

One of the most damaging explosions on record occurred a few years ago from this cause. The pipe run out through the side of the building and some distance beyond. It became filled with water, which froze up solid, in consequence of which the boiler blew up from failure of the safety-valve to relieve the pressure.

Another way of putting up escape pipes from safety-valves is to run them into the chimney or the flue which leads to the chimney. This is frequently resorted to when the chimney power is deficient, and the reason given for it is that "it improves the draft." It is difficult for a disinterested person to see how this device operates to "help the draft" unless the valves are blowing off steam, and we confess our inability to see why the draft should be improved at that time. However, we suppose a poor apology is sometimes better than none at all.

One potent reason why safety-valves should never be put up this way is this: It is impossible to tell when a valve is tight, when it is so connected. It may leak, and become a source of great waste, without anyone knowing anything about it. A valve should never be put up so that any leaka of steam will fail to make itself manifest immediately. Safety-valves should never have an "escape-pipe" attached to them. They should be allowed to blow freely into the boiler-room. The objections to this plan are fast disappearing among intelligent steam users and engineers, and in the very best arranged boiler-houses that have been built lately, the safety-valves are put up in this manner. This arrangement is not only the best, but it is also the *cheapest*, as all the extra pipe-fittings and useless labor are saved.

There can be little doubt that it would have been a blessing if the ordinary lever safety-valve had never been invented. If the inventor's design had been to make something possessing every facility for being tampered with, instead of making a safety-valve, he could not have succeeded in a more admirable manner. The lever offers every facility for over-weighting, at the caprice of an ignorant or careless boiler attendant. If more steam is wanted, if from any cause the demand for steam is irregular, so that much care is required to prevent often blowing off, or if the valve leaks, the sovereign remedy is to slide the weight out further on the lever, or attach all manner of junk to save trouble. And observe how admirably the thing is contrived to produce much overweighting with little effort. The multiplying principle of the lever is brought into requisition, so that a pound on the end of it may be equal to anywhere from five to ten pounds on the valve, and the effect of hanging a few old bricks, gears, pulleys, or pieces of anything that has weight, on the end of the lever, would be equal to a whole junk shop if placed directly on the valve. And the lever is such an inviting place to hang scraps of all kinds, that many boiler attendants are simply unable to resist the temptation to do so on the slightest provocation.

A really good safety-valve should possess the following qualities in the highest possible degree:

First. It should be of the "dead-weight" type of construction. No steelyard lever should be allowed in its construction; it would then require much more weight placed on it to produce a dangerous degree of overloading.

Second. Its construction should be such that it would be no easy matter to place extra weight upon it, and such that an extra weight could be readily seen by any one.

Third. It should be connected to the boiler so as to be easily accessible, and no escape pipe should be connected to it, and it should be arranged so as to be easily lifted once or twice a day by the attendant.

Fourth. It should always be an independent fixture, attached directly to the boiler, and should have no connection whatever with any of the other fittings on the boiler.

The Pennsylvania Railroad has just adopted the plan of carrying on the locomotives of that line a tin medical box, 6⅝" long, 4½" wide and 3¼" deep. This box is to be fitted into a chest on the tender. The following printed directions are affixed to the cover:

MEDICAL BOX.

To be kept on each locomotive, and used in case of accident only.

OUTFIT.

1 rubber compress, 1 package (1 oz.) of absorbent cotton, 6 rolls of bandages, 1 pyramid of pins.

This outfit must always be kept up, and when anything is needed requisition should be made at once.

DIRECTIONS.

When an arm or leg is crushed, causing hemorrhage, pass the compress around limb immediately *above* the injured part, in case of *rupture of an artery;* or immediately *below* the injured part in case of *rupture of a vein*, tying it tightly until the arrival of surgeon.

The rupture of an *artery* can be distinguished by the color of the blood, which is *red*, and *spurts out*, while the *vein* has *black* blood and *flows continuously*.

For wounds on the *head* or *face*, apply the absorbent cotton, and bind it with a bandage secured with pins.

Out in Milwaukee they call it "shortage." The amount was $480,000.—*Boston Commercial Bulletin.*

The "Lancaster" Adjustable Stocks and Dies.

The accompanying engravings represent a new stock and dies, made by the Lancaster Manufacturing Company, 95 and 97 Liberty street, New York. These stocks are made to cut a large variety of sizes of both bolts and pipe, and also for cutting off pipe to lengths. Referring to the engravings, it will be seen that the dies used, three in number, are designed especially with a view to rapid and easy cutting, to assist in and to preserve which they are also made with a view to being easily and quickly sharpened on a grindstone. As shown, the dies are held in position in the stock by means of the plate, which is removed by a partial turn of the binding screws, thus providing for quick removing of dies for changing or sharpening.

It will be seen that two of these dies are, when in use, firmly fixed by abutting against the metal of the stock, while the other one is free to be adjusted by turning the handle shown. In fitting, a plain mark is made, so that when the adjustable die is brought to correspond with this mark the dies are in position for cutting standard sizes. If desirable to cut over or under size, it can be readily accomplished by passing by, or stopping short of coming to this mark. This mark being used for gauging the size, also enables the operator to detach the dies from the finished work without turning back on the threads. This not only saves time, but also saves the dies, and to a considerable extent preserves the finished threads.

The adjustable pipe-guide is simple, but novel in construction, one guide serving for holding all sizes of pipe (and when desired bolts) without bushing or making any changes of parts. To accomplish this, three jaws are hinged as shown, and are moved together simultaneously like the jaws of a chuck, by means of the milled nut shown, the inner surface of which is beveled to fit the incline of the jaws. By this means the guide can be quickly adjusted to fit any size of pipe or iron, thus obviating a loose fit, if the pipe or iron is under size, and avoiding the necessity of grinding if over size. This guide can be readily attached to or removed from the stock.

When used for cutting off pipe, the cutting dies are removed, and the two blank dies and the cut-off die shown are substituted.

Chinese laborers on the Southern Pacific Railroad earn one dollar and sixteen cents a day, and are hired by gangs of forty from agents of the six companies in San Francisco. The usual estimate of the effectiveness of their labor is that three Chinamen are equal to two white men; but a superintendent of construction on the railroad asserts that he prefers the Chinese, man for man, to such white labor as can be had on the Pacific coast.—*Railway Age.*

The Kansas City *Journal* says: A smoke-consuming engine, the joint invention of Mr. Kearney, master mechanic of the St. Louis and San Francisco Railroad, and Mr. Hawley, of Cincinnati, is being experimented with, and the results are most satisfactory. The draft, instead of being turned upward, as in an ordinary engine, is downward, thus throwing the smoke and cinders back into the fire-box to be consumed. In the experiments thus far made there has been a saving of about 50 per cent. in fuel, it is said.

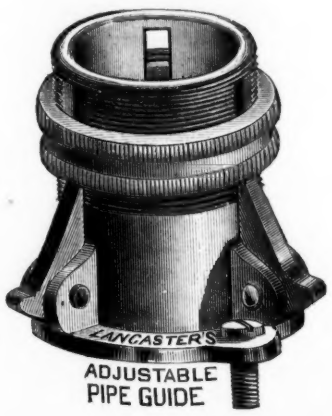
The *Rome* (N. Y.) *Sentinel* has a department headed "Locomotive Sparks," in which we find a number of items about the new locomotive works in that city. This shows true enterprise, and will doubtless be appreciated by those interested in the industrial development of that city (who far outnumber the politicians). We often look in vain for manufacturing news in the papers published in large manufacturing cities, although column after column is filled with speculations upon the chances of certain political candidates.

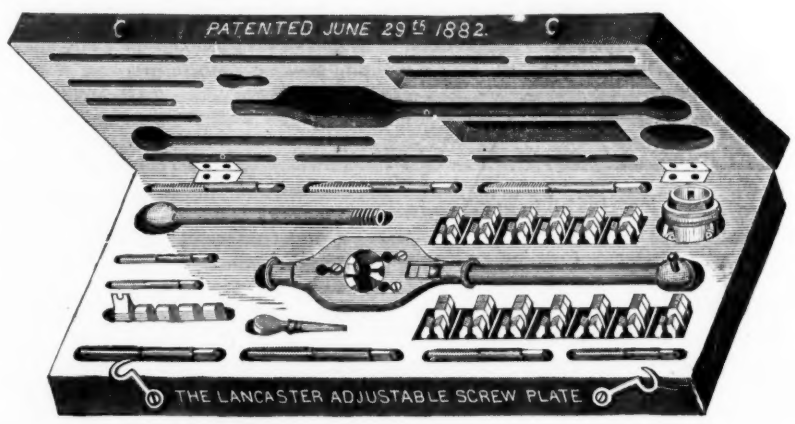
LETTERS FROM PRACTICAL MEN.

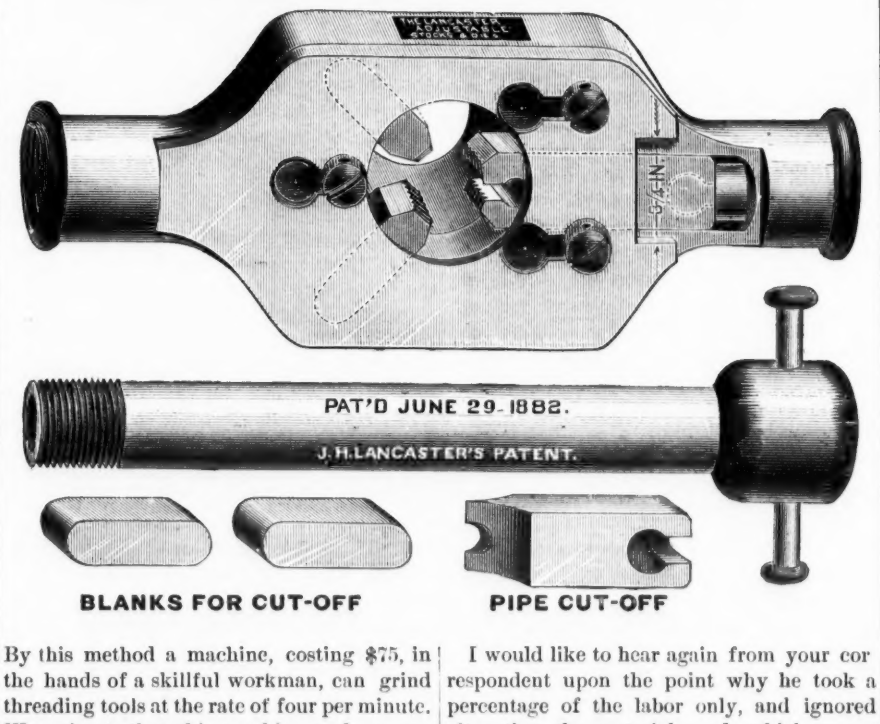
Grinding Machine for Screw-Cutting Tools.

Editor American Machinist:

Our method of securing a constant angle, with proper under cut on screw-cutting tools is by a special tool or machine kept in the tool-room, where all threading tools are ground and kept in stock, ready for instant use. This tool consists of a spindle of hardened steel running in hardened steel bearings, carrying an emery lap or wheel, and a proper holder for the tool on a cross slide.







By this method a machine, costing $75, in the hands of a skillful workman, can grind threading tools at the rate of four per minute. We estimate that this machine tool pays us 50 per cent. per year on the investment.

Waltham, Mass. AMBROSE WEBSTER,
Supt. American Watch Tool Co.

Incidental Expenses in Manufacturing.

Editor American Machinist:

A few months since I read in your columns some remarks from a correspondent upon the subject of the incidental expenses connected with carrying on the machine business. I was in hopes that his communication would have brought forth from other writers their views on the subject, for I deem it an important one.

As near as I can recollect, your correspondent took the ground that, in calculating the actual cost of an article, the net outlay for material is first to be reckoned; to that is to be added the amount of wages, and to cover the incidental expenses he took 50 per cent. of the wages paid on the special article manufactured. To illustrate: Suppose the materials to cost $100, the labor $50, and the incidental expenses $25, thus making a total of $175. This seems a large amount—one-half of the wages—to allow for incidental expenses; but it is possible that more items of expense were embraced under the 50 per cent. allowance than I am aware of. Of course, such expenses as rent, power, insurance, taxes, heating, lighting, and repairs should be covered, but I am not equally sure as to salaries of non-producers and other costs of selling. As to these latter expenses, I have heard experienced manufacturers assert that they should not be added to the cost of the manufactured article. However, as the book-keeper, the time-keeper, the stock clerk, the office clerks, errand boys, &c., are to be paid from the proceeds of the factory product, it seems to me only reasonable that their salaries should go into the incidental account.

Being engaged in manufacturing in a moderate way, I feel that my interests are concerned in having other manufacturers, especially those in my line, fully alive to the fact that in making their reckonings of the cost of their productions, they should allow a certain percentage to cover the incidental expenses of their business.

I would like to hear again from your correspondent upon the point why he took a percentage of the labor only, and ignored altogether the material used, which was a component part of the work. CHIPS.

Shop Practice.

Editor American Machinist:

Our city once supported a machine shop and foundry which a much larger place might have been justly proud of. Perhaps its growth was abnormal, and this may account for its failure. Be this as it may, its fine tools and equipments are now scattered and go to make up a half dozen smaller concerns.

These establishments, of course, have neither Presidents nor vice-Presidents, Secretaries nor Board of Directors to *look into things* and change superintendents. Each goes on in a quiet, unassuming sort of a way, trying to be as independent as it can.

But the very nature of things requires a good degree of sociability all round, for while Gill & Co. have a foundry and a good lot of patterns, they have no machine shop equipment, excepting one drill-press and a grind-stone. On the other hand, Tatem & Dingfelder have a job shop with fair tools; no foundry or blacksmith shop, but among other things have a lathe, one of the primitive sort, that will swing any diameter (depending on the amount of earth you wish to remove), also a small gear-cutter, so that their more pretentious neighbors often have work to send to them of a character adapted to these tools. Again, in turn, they must get what forgings and castings they want of their neighbors.

The Wassman Car Works are seldom out for favors, but as they have a steam hammer and a hydraulic press, these are sometimes pressed into the general service.

The Lewis Machine Company, and G. W. Wheelwright are about equally provided with machine tools, foundry and blacksmith shops, and often interchange castings and patterns.

Such a variety of facilities for having work done should be appreciated by the surrounding community; besides, a lively competition has the effect to equalize prices. Then, when one shop gets a little spurt of work, it is so easy to coax a hand or two away from another shop, it only being necessary to pay twenty-five or fifty cents a day more for the time being. Of course this is hardly the right thing to do, but it can only be prevented by giving the man a raise. Then a number of shops in a comparatively small place helps to make machinists.

The apprentice often avails himself of an opportunity to get a better job after working a year or so, and beginning to be able to do a fair job on the drill-press, he finds that by changing shops he can about double his wages.

This don't seem quite right, when there has been an agreement, either verbally or in writing, that he was to serve a term of three years. But under the circumstances it is hard to convince an apprentice that this is wrong.

We, however, did not have such *advantages* as these, and stayed four years where we began our trade, and have never had cause to regret it. DYNAMICUS.

Boring Bars and Cutters.

Editor American Machinist:

Referring to the article in the AMERICAN MACHINIST of September 30th: "An Improved Counterbore," by W. H. Druckemiller, he says he thinks it more simple and easily made than the one shown by me in your issue of Sept. 2, 1882, but fails to state wherein. He says he uses a right-hand thread instead of a left-hand, but fails to give the objections to a left-hand thread. He makes the cutter a neat fit in the mortise to prevent starting the nut loose. Any one having experience in work of this kind will know that to fit cutters to a slot so that they will not move at all, requires pains and time. Now with the device, as shown in my sketch, there need be no care whatever as regards the thickness of cutters; even should they vary $\frac{1}{16}$" in thickness, the left-hand nut will always jam the cutter against the side of the slot, that it will naturally come in contact with in doing its work; therefore it will never come loose.

The plan of cutter shown by him is objectionable, the cutter being cut out on the edge, weakening it and making it liable to break when used in that kind of a bar. It is also liable to crack in hardening. A cutter, straight on the edge on which the cutting is done, is always preferable for strength. In a description by me of a counter-boring tool, in the AMERICAN MACHINIST of July 29, 1882, I show a cutter of this kind; the purpose being to retain the strength of the pin on the same, but the cutter is strongly backed by the solid metal of the bar, therefore it is not liable to be broken.

The plan of having offset on top of the cutter I think more desirable, because no matter which way the cutter is put in, it will always be true without the necessity for the accurate work required with the style of cutter shown by Mr. Druckemiller. He says

the accuracy of the tool, as he makes it, depends upon the manner in which the cutters are fitted. The only accuracy required in the cutters, as shown by me, is to turn the shoulder or offset to exactly the size of the inside of the nut or sleeve. He also uses a hexagon nut, in order to allow the "free use of the monkey-wrench," on account of a special wrench not always being at hand. In shops where many men are employed, and many using the same tools, this will be found very objectionable. The sizes and leverage of monkey-wrenches vary, and little judgment is exercised in their use; hence a tool of this kind will soon be ruined by their use. For this reason I use a special or spanner wrench of proper length, by which means the tool is secured. Making it in the way shown *prevents* the use of a monkey or any other except the special wrench.

A special wrench for any tool or appliance should be a part of that appliance, and always be with it.

According to the sketch, Mr. Druckemiller employs a square shank, but does not state the advantages of it. I prefer using the Morse taper-turned shank, which is more easily fitted and brings the bar true in the drill-press. A. B. LANDIS.

Waynesboro, Pa.

Ancient Standard Measurements.

Editor American Machinist:

September 29, 1882.

If your interrogator, "G. G. 335," of Staten Island, wishes to know something about the origin of our ordinary inch, or British inch, and a good deal of information on the science of metrology in general, I commend to his attention a very interesting work entitled "Our Inheritance in the Great Pyramid." He will perhaps be surprised to learn that civilized man, in this the golden age of human *material* progress, has no standards of metrology (except in the matter of measuring time), using the word "standard" in its strictest sense, while in an age which we are wont to regard as more or less primitive, 4,000 years ago, men had standards for all measures, unalterable, universally adaptable to that age or this, or any age to come, and that our "*inch*" had its origin then and there, *i. e.*, Egypt. W. C. COX.

Mobile, Ala.

A Cheap and Effective Steam Trap.

Editor American Machinist:

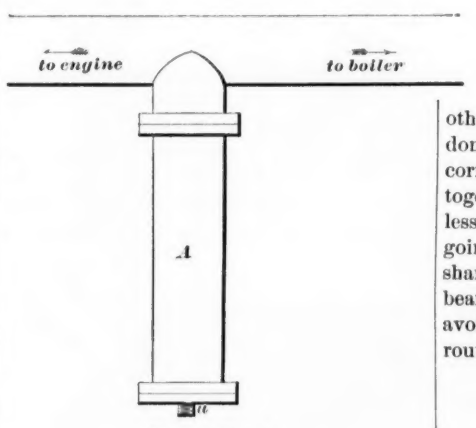
Some years since, before steam traps were so well known or so extensively used as at present—in fact, before they were brought to a state of perfection that made them really worth using—I had something to do with the internal arrangements of a manufacturing establishment in which the engine was situated about 150 feet, and across a drive-way, from the boiler. The steam was conveyed from the boiler to the engine through a five-inch pipe, the pipe rising from the boiler and passing some twelve or fifteen feet overhead to the engine. Near the engine the overhead steam pipe was provided with a flanged branch looking downward, to which was attached a piece of five-inch pipe, eight or ten feet in length. The lower end of this pipe was covered with a flange, into which was screwed a one-inch nipple for attaching a drip cock. The arrangement of this pipe may be seen from the annexed sketch.

It will be inferred from this that the pipe *A* served the purpose of recovering the water carried over with the steam, and that condensed in the pipes just before the steam passed into the engine. The water found its way by gravity into this pipe, the intention being that the engineer should at frequent intervals blow this water out of the drip cock, screwed on the nipple at *a*.

As might have been foreseen, the difficulty with this arrangement was in the fact that, through neglect, the water was sometimes allowed to accumulate in the pipe till it became filled, when about a gallon at a time would be carried over into the cylinder, with the usual lively results. As this would hardly do, a steam trap was tried, but, as previously intimated, steam traps at that time were not a *perfect* product, and the result was but little, if any, better.

The water level in the boiler being below the center of the pipe *A*, vertically, the thought of making a blind water line of that pipe, which should serve as a trap, suggested itself. The connection was already made with the steam in the boiler, through the steam pipe, which, being large for the quantity of steam used, maintained a very even pressure. To make the connection with the water, a pipe was run underground from the nipple *a* to the boiler.

This arrangement worked entirely satisfactorily, the water in the pipe *A* being kept at the same level as in the boiler, any accumulation beyond this being returned to the boiler hot—a direct saving over blowing it into the sewer. It made a first-rate steam trap at a small cost. FRANK GLEASON.



STEAM TRAP.

Another Electrical Theory.

Editor American Machinist:

In your issue of Oct. 7, I notice a theory given by Philip Jackson to support the statement that the electricity passes up a lightning rod instead of going down.

Now the action of lightning or electricity on pointed conductors is the same to-day as when Franklin demonstrated it by protecting objects by pointed conductors.

Mr. Jackson says that it is a well-known fact "that electricity cannot remain on a perfectly pointed body," but he omits the equally known fact, that electricity will pass from an electrified body to a pointed body without any violent effect whatever. It is generally admitted that it is the clouds that are electrified and not the earth. To accept Franklin's theory, that an electrified body contains more than its natural share of the fluid, the object is to restore the equilibrium between the two, and the pointed rod conveys the fluid to the earth without any violent effect, as in any smaller experiment.

The lightning may go up a rod, but it is just as probable and more so, that it goes down. OSBORN P. LOOMIS.

New Britain, Conn.

A Broken Engine Shaft.

Editor American Machinist:

At Spring Lake, Mich., Saturday, Sept. 30, between 10 and 11 o'clock, A.M., an engine in a saw-mill broke its shaft. The engine was a single slide-valve engine of 26 inches bore and 30 inches stroke. The break occurred directly back of the crank-wheel, and flush with it all around. The consequences were as follows: The shaft, with the eccentric, continued to revolve for a short time, letting steam into the cylinder as usual, which set the piston on a jump, back and forth, from one end of the cylinder to the other, carrying connecting-rod and crank-wheel with it. When steam was shut off, and the atmosphere cleared enough to see what the matter was, the back cylinder head was found lying on the floor, divided into several pieces. The piston was badly broken, but did not fly out of the cylinder.

A large piece was taken out of the flange of the cylinder at the end of one of the steam ports. The crank end of the bed was knocked out, also a cross-rib in the bed. The connecting-rod was bent at crank end. The flange of the stuffing-box gland was broken, and the two stud bolts on stuffing-box were forced apart by the hub of the cross-head coming in between them.

The crosshead forced the stuffing-box gland in an extra inch or two, illustrating how quickly the packing can be set up by steam power when everything is ready. The size of the shaft in the pillow block was 8 inches; the end fitting into the crank-wheel had been turned down to 7 inches, leaving a square shoulder ½ inch deep, with square inside corner where the break occurred.

The appearance of the break showed plainly that the shaft had been partially broken in two for a long time. The old break was deepest on the side of the shaft next to the wrist-pin and directly opposite, leaving a comparatively thin body of solid iron in the center, allowing the crank-wheel, by action of steam pressure, to oscillate, as on a hinge, until it finally parted.

The very common practice of turning down the end of a shaft where a wheel, a crank, or a coupling goes on, is senseless. I think it is done nowadays, because it was done in other days; but I cannot tell why it was done in other days. The square inside corner is made because the parts can be fitted together with a trifle less work, and there is less liability of the wheel stopping short of going on up to the shoulder. Nevertheless, sharp inside corners or grooves on shafts bearing heavy transverse strains should be avoided, as they weaken the shaft more than round inside corners or grooves.

J. E. MCCONNELL.

Belt Driving.

Editor American Machinist:

Permit me to take a few exceptions to the statements concerning belt driving, in your issue dated Sept. 23.

(1.) The surface left by a broad, flat tool is not so good for most belts as one made by cross-grinding with a stone or an emery wheel, so as to give marks parallel with the shaft instead of round the pulley face.

(2.) Brightly burnished pulleys drive better with some belts and under some conditions than roughened ones.

(3.) The driving power does not vary as the square of the arc of contact. So far from this being the case, doubling the arc of contact can under hardly any circumstances be made to give as much as double the drive.

(4.) A belt two inches wide will hardly ever drive twice as much as two belts, each one inch wide, and having the same tension per inch width.

(5.) The table giving the least diameter of pulley desirable for various widths of belt, would, if correct for one arc of contact and tension, be incorrect for any other.

(6.) On vertical belts, that is, those connecting horizontal shafts one above the other, the heavier the belt the less the driving power, because it sags from the lower pulley.

(7.) If the driving power of a belt is calculated from the smaller pulley alone, simply because it is the smaller, the result will not be correct. The arc of contact, and the lineal contact, and many other things, come forcibly into play, and this is especially so on elevator pulleys, where one shaft is nearly directly above the other.

The writer of the statements to which I referred is so widely and so favorably known that I regret to contradict him, but in this particular direction I have the results of a very wide personal experience, and the written and oral expressions of many others, embracing the most varied and trying practice in transmission.

The records of many tests, giving results directly contradictory to the statements of your correspondent, have been published by me during the past two years in various technical journals in this country and Europe, and most of them can be repeated in half an hour's notice, if your correspondent will favor me with a call. I also offer the following reasons and authorities for my statements:

(1.) Leather belts (especially if thick under small pulleys) wrinkle and ridge crosswise on the under side when going over the pulley; and these crosswise corrugations engage better with grindstone marks running across the pulley face than with circumferential lathe tool marks.

(2.) A gum belt with a smooth elastic surface beds well down to a polished surface, and will drive better on this, if the pulley is large, than on a rough surface. This is not true of leather, nor of canvas belts.

(3.) Briggs and Towne quote the driving power as varying in the following proportion with the arc of contact:

Angle.	Lbs.	Angle.	Lbs.
90°	32.83	150°	44.64
100°	34.80	180°	49.01
110°	37.07	210°	52.52
120°	39.18	240°	55.53
135°	42.06	270°	57.58

As $90^2=8100$, and $270^2=72{,}900$, which numbers are as 1 to 9, we would expect, if the grips varied as the square of the arc of contact, that if 90° gave 32.83, 270° would give $32.83\times 9=296.47$ lbs. whereas it gives only 57.58 lbs. Doubling the arc gives

$$\frac{49.01}{32.83}=\text{nearly } 1.5 \text{ times}$$

the grip, not four times.

The first figures I lay my hands on among my own test records, are of a 4-inch four-ply cotton belt on an 18" turned cast pulley, with 100 lbs. tension = 25 lbs. per inch of width. The grip was 244 lbs. with 90° arc, and 394 lbs. with 180°; the ratio being as 1 to

$$\frac{394}{244}=\text{about } 1.6.$$

The next is a 12-inch 4-ply rubber belt on the same pulley, with 400 lbs. tension. With 90° arc, the grip was 244 lbs.; with 180°, 418 lbs.; the ratio being as 1 to

$$\frac{418}{244}=\text{about } 1.7.$$

(4.) Two one-inch belts will bed more readily, especially on a small pulley, and if the belts are thick, than one two-inch, having the same total tension. In fact, I know where a 3-inch belt has run a machine better than a 6 inch.

I find on my records the following memoranda of a 6-inch 3-ply and a 3-inch 3-ply rubber belt on a 36-inch cast iron pulley:

		6 inch.	3 inch.
90° arc	195 lbs. ten.	206 lbs. grip	210 lbs. grip
	400 " "	405 " "	316 " "
180° arc	195 " "	426 " "	440 " "
	400 " "	721 " "	682 " "

The above figures are worth studying, as they tell something about tension as well as about belt width, for if we divide each of the results with the 6-inch belt and 400 lbs. tension by two, we shall not get as much as with the 3-inch belt and 195 lbs. tension, (which is rather less than ½ of 400 lbs). In other words, with 90° arc, two 3-inch belts each with 195 lbs. tension would have a grip of 420 lbs. while the 6-inch had only 405 lbs. with 400 lbs. tension. With 180° arc, two 3-inch belts, each with 195 lbs. tension had a grip of 880 lbs. and the 6-inch belt with 400 lbs. tension had only 721 lbs. grip.

(5.) The driving power of a belt depending on so many elements—pulley diameter, material and condition and amount of crown, arc of contact, and belt material, width and thickness and tension—any table taking note only of belt width will be of no use.

ROBERT GRIMSHAW.

Philadelphia, Pa.

Marking the Degrees on Planer Heads.

Editor American Machinist:

I write in relation to a practice of builders of iron planers, of figuring the degree circle from the side of the tool head, so that it reads from 0 on the center of the side around to top and bottom, which I found the other day to lead to a wrong impression, by some that were not entirely familiar with the degree circle. In planing a compound rest of 60°, the tool-head, as it reads, has to be set on the 30° mark, which carries to the workmen the impression that they are planing a 30° angle from the horizontal plane of their work. Now, what I claim is that it should read 90° from what they now call the starting point, or else be figured both ways. What I would

like is, the opinion of yourself or your correspondents in regard to this point.

Montpelier, Vt. Willis Hanaford.

[Our correspondent has raised a point which has frequently been raised in one way or another. There is apparently something about the way the degrees are marked on a planer head that is not calculated to make the marking serve as an educator to those who don't think much about such things; but the pertinent question is, can it be marked in such a way as to better explain itself. We shall be pleased to hear from tool builders and others on this subject.]

Boiler Construction and Setting.

Some months ago *The Locomotive*, published by the Hartford Boiler Insurance Co., gave an illustrated article showing a plan of setting a 20 foot × 66 inch boiler, which we reproduced in the American Machinist. We take from *The Locomotive* this week another illustrated description of an approved boiler setting which the Boiler Insurance Company have had applied to a number of boilers under their supervision and which they say has in every case worked fully up to and beyond expectations.

"The boilers are of unusual dimensions, and to insure the best results the setting must be carefully done. In most cases chimneys have been planned with special reference and adaptation to them, so that they have not been recommended except where an entirely new boiler-house and chimney were to be erected. A more common size of boiler is 16 feet 3 inches long outside and 60 inches in diameter, containing 66 tubes, each 3 inches in diameter. The front of the boiler is what is known as the projecting cut-away front, as shown in the following Fig. 1. The tube heads are 15 feet apart; tubes 15 feet long. They are set in vertical and horizontal rows, with a broader central vertical space. The tubes are arranged to secure the best circulation of water. There are 20 braces in all—10 on each head. These braces are secured to pieces of T-iron placed radially on each head, as shown in Fig. 2. The Company found this methed of securing braces advantageous for two reasons. The pull of the brace is straight from the web of the T-iron, a jaw being made on the end of the brace, which is pinned and keyed to the web; and second, the pieces of T-iron riveted to the head give it stiffness. The braces should be made of iron at least one inch in diameter, *with no weld.*

"Every boiler should be supplied with two nozzles, one for steam and one for safety-valve. The practice of putting up a nest of boilers with only one safety-valve is dangerous and pernicious. Every boiler should have its own independent safety-valve. It will be noticed in Fig. 1 that there is a door at rear end of setting three feet by two feet. This is important to facilitate cleaning the bottom of boiler, and for removing ashes that may accumulate in rear of bridge wall. We would call attention also to the man-hole frame. It should be put on the inside of boiler shell. If well done, a more effective reinforcing of the strength of man-hole is secured, as well as a tighter joint. In preparing the foundations for boiler settings, great care should be taken to see that they are firm. Many boiler foundations are simply brick work laid on the ground. When the boiler has been used a short time, the foundations settle and the walls crack and tumble down. Do the work well, even if it costs a little more to begin with; it will be economy in the end. The walls should be heavy, with air spaces in the center to prevent fractures from expansion and contraction. Fig. 3 shows the plan of boiler and setting. The feed should be introduced through its own independent pipe, with suitable check and stop-valve. It is not good practice to blow and feed through the same pipe. There are many details in the designing, construction, and setting of boilers which must not be neglected if safety and economy are to be attained.

"Tubes of greater diameter than three inches may be used with good results; all depends upon their proper arrangement. The Hartford Steam Boiler Inspection and Insurance Company furnishes plans and specifications for both boilers and settings for its patrons, and will supervise the settings if desired. It also prepares plans for boiler-houses and chimneys. Hundreds of boilers are now in use which have been built and set from its plans and specifications."

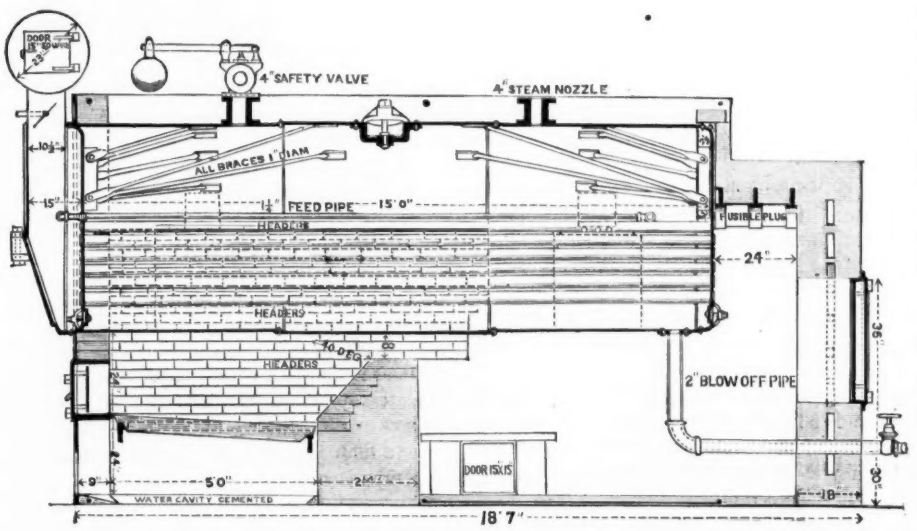


Fig. 1.

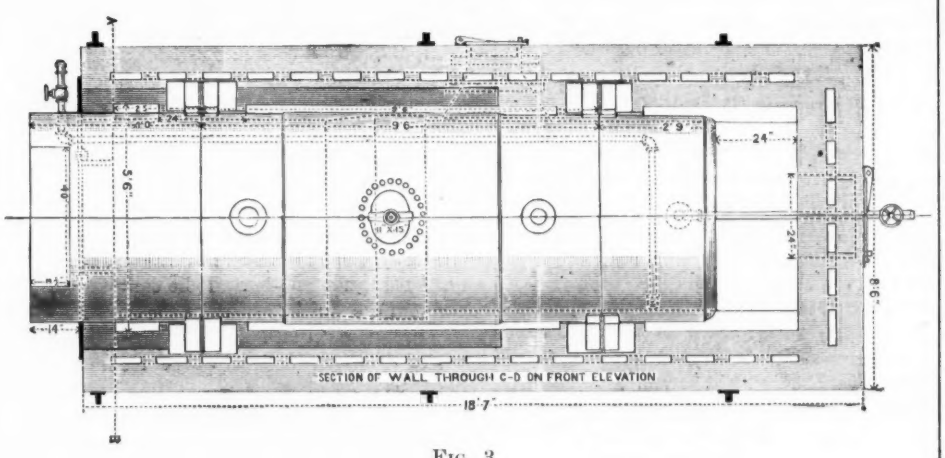


Fig. 3.

Personal.

Mr. P. M. McLaren, formerly representing the Strong Heater in Boston, Mass., has just accepted a very flattering offer of a position with the Babcock & Wilcox Company, 30 Cortlandt street, New York. Mr. McLaren is a gentleman who well deserves all the success that has attended his efforts to make substantial progress in business. He has our best wishes accompanied with the hope that his success may be continuous and satisfactory.

The *Railroad Gazette* of Sept. 29th, has information of the building of 121 miles of new railroad, making 7,285 miles thus far this year, against 4,774 miles reported at the corresponding time in 1881, 3,607 miles in 1880, 2,224 miles in 1879, 1,267 miles in 1878, 1,396 miles in 1877, 1,677 miles in 1876, 804 miles in 1875, 1,396 miles in 1874, 2,778 miles in 1873, and 4,970 miles in 1872.

Edward White, master mechanic of the Brooklyn, Flatbush and Coney Island Railway, was recently made the recipient of a handsome testimonial from the engineers and shop-men of the company, in the form of a splendid gold watch, chain and charm.

The government of the Massachusetts Institute of Technology, says the Boston *Commercial Bulletin*, has made arrangements for a regular and thorough course of instruction in electrical engineering, including the theoretical studies in mathematics, chemistry, and physics necessary to equip the student for original investigation, as well as practical training in all the modern applications of electricity.

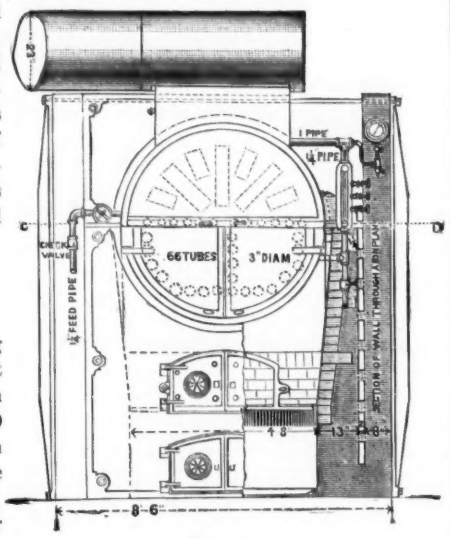


Fig. 2.

INDUSTRIAL NOTES.

Albert Arnold, Worcester, Mass., formerly foreman of the Crompton Loom Works foundry, is erecting a new foundry 50 x 60 feet, which will soon be ready for operations.

The Ball Engine Company (Limited), of Erie, Pa., inform us that they are building and selling engines with their new governor (illustrated in the present issue of the American Machinist), as fast as their facilities will permit.

I. L. Penney, Minneapolis, Minn., makes a spring hammer which seems to give satisfaction. One of his customers writes: "To say that we are well satisfied does not express it. In fact we like it so that we sit up nights to run it."

It is stated that the Norwalk shops of the Lake Shore & Michigan Southern Railway are to be removed to Elyria, Ohio, or Berea, so as to render them more accessible to the Sandusky division of the road, and that a site has been found just east of Olmstead Falls and Berea.

The Stonemetz Printers' Machinery Co., Erie, Pa., have moved into their new shop, the dimensions of which are 40 x 120 feet with blacksmith shop attached. The lot is 165 feet square. They are doing a good business and report orders as coming in freely for almost all kinds of printing machinery, particularly for their specialties.

One hundred and fifty men are employed in the Rome (N. Y.) Locomotive Works. The erecting gang are putting together the parts of the first two locomotives which in short time will be ready to send out. The workmen talk of organizing a building association and a mutual relief society.

The City Foundry and Machine works, at Belleville, Ill., is working a regular force of twenty-five hands, and is adding to their stock of machinery one boring machine, one new thirty-foot lathe and two drill presses. Their specialties are drill presses, emery grinders, coal hoisting machinery and coal boxes, cars and axles.

We learn from the Cleveland *Trade Review* that the National Machinery Co. of that city have erected at Tiffin, Ohio, capacious workshops the ground secured admitting of future extension. Several liberal offers were made to locate elsewhere, but the liberality of the citizens of Tiffin, together with its railway facilities, determined the location.

The new factory building in the course of erection at Grand Rapids, Mich., by Mr. R. Bissell, manufacturer of carpet sweepers, will be one of the most substantial in the city. The main structure will be 40x100 feet in size, and six stories in height, and the engine house, situated in the rear of it, will be 40x100 feet in size and four stories high. The engine will be of 200-horse power.

The Kensington Engine Works, manufacturers of the Buckeye engine, of Philadelphia, have just closed a contract with the Sauquoit Silk Manufacturing Co., of that city (who are building a large mill in Scranton, Pa., to make umbrella silk) for their entire plant, engine, heaters, pumps, injectors, piping and shafting. They also furnished the working drawings from which the boilers were constructed.

P. Jewell & Sons, of Hartford, Conn., have just completed a mammoth belt for the Washburn & Moen Manufacturing Company. It is 124 feet long, 38 inches wide and four thicknesses of leather, making the belt just one inch thick. It weighs 1,834 pounds, and is probably the heaviest leather belt ever made. It is to run from a 36 to 11 foot pulley, and is intended to convey 1,500 horse power.

The Port Chester Bolt and Nut Co., of Port Chester, N. Y., have completed their buildings and are placing their special machinery in position for the manufacture of tire bolts. The power will be supplied by a Sweet Straight Line Engine and Babcock & Wilcox Boilers and the plant throughout will be of the most approved pattern. The officers are Wm. E. Ward, Pres., Samuel Comly, Treas., Chas. Eldredge, Sec'y, and Wm. L. Ward, Manager. They expect to be in the market by November 1st.

The extensive machine shops of the Chicago, Milwaukee and St. Paul road, located at Minneapolis, Minn., are rapidly approaching completion. Up to the present time the following buildings have been completed: Locomotive machine shop, 352×112; boiler shop, 210×90; blacksmith shop, 306×70; supply office, 272×50; car shops, 280×85; paint shops, 360×85; roundhouse, 32 stalls. These buildings will be supplied with the necessary machinery as soon as it can be shipped from the East. The total outlay on the various buildings will be in the neighborhood of $1,500,000.

The manufacture of the Leader sewing machine is just beginning in the brick building on Taylor street, says the *Springfield Republican*, owned by the Steam Power Company, which was built as an addition to the Springfield Sewing Machine Company's factory. The Leader Company have their headquarters at Cleveland, O., and a capital of $250,000. The president is S. E. Henderson, lately manager of the White Sewing Machine Company. The company now employ 26 men, under J. H. Osborn, as superintendent, and their principal work thus far has been the making of small tools with which to construct their machines. They expect to increase their force in due time to 60 men and to be able to turn out 100 machines a day. Most of them will be shipped to Cleveland for sale.

The following certificates have been filed with the Connecticut Secretary of State since June 1: The Francis Manufacturing Company, of New Britain, certificate of organization for the manufacture of hardware, capital stock $25,000; the Hartford Iron Works Company, certificate of incorporation, capital stock $25,000; the Yale Automatic Brush Co., of New Haven, for the manufacture of automatic or self-feeding brushes, capital stock $2,500; the Foster Hardware Company, Meriden, capital $30,000; the Bridgeport Malleable Iron Company, capital increased from $20,000 to $100,000; the New England Silk Company, Winchester, Litchfield county, capital $50,000; the Babcock Printing Press Manufacturing Company, New London, capital stock $20,000; the New Haven Novelty Company, capital $5,000; the Frary Cutlery Company, Bridgeport, increase of capital to $150,000; the Ingersoll Manufacturing Company, Stamford, for the manufacture and repair of machinery, capital stock $6,000; the J. A. Canfield Company, Middletown, for the manufacture of rubber goods, capital stock $10,000; the Rockford Woolen Company, Middletown, capital stock $25,000; the W. G. & A. R. Morrison Company, Windham, for the manufacture of machinery, capital stock $50,000; the Hotchkiss & Upton Company, Farmington, for the manufacture of nuts and bolts, capital stock $120,000; the Lincrusta-Walton Manufacturing Company, Stamford, for acquiring letters patent to manufacture embossed fabrics, panels, slabs, floor cloths and the article known as Lincrusta-Walton, capital $300,000; the Salisbury Iron Ore Company, Salisbury, Litchfield county, capital stock $15,000.

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NEW YORK, OCT. 21, 1882.

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Making New York State Canals Free.

As we believe the question of doing away with tolls on the canals owned by the State of New York, is not a question with which any particular political party is identified, it may be worth while to consider the merits of the proposition from an industrial and business point of view. The voters of the State are called upon this Fall to vote upon a constitutional amendment embodying this proposition, without reference to party politics, and its consideration at this time is therefore pertinent.

To the people living in counties remote from the canals, the question assumes this special form: Shall we vote to tax ourselves for the maintenance of the canals, without direct return in the form of tolls? Superficially viewed, this is one of the questions which suggest their own answer. But when it is considered, that freeing the State waterways from tolls must tend to an immense increase of business and taxable property in the cities and districts most immediately adjoining, the consequent possibility of lightening the rate of taxation in even the most remote parts of the State in far greater degree, becomes at once an actuality, which is well worth considering. Furthermore, whatever tends to build up the business and increase the population of any portion of the State, as directly tends to build up a home market for the agricultural and manufactured products of every other portion. The argument here is akin to that which is the chief basis of our present protective tariff system.

To the railroad interests centering in the city and State of New York, the question of the abolition of tolls on the State waterways, likewise assumes a specially interesting and significant form. It is not in human nature to look at impending or proposed changes of this kind with other than an eye of suspicion, and persons employed in directing and transacting railroad business are quite as human as other men. A retrospective and prospective view of this question, may therefore not be without interest to this large and influential class.

When the Erie Canal was first opened, forty years ago, the railroad interests of the State of New York amounted to little or nothing, if they could even be said to have any existence. The railroad business of the State has, therefore, grown to its present immense proportions all the time in full competition with the artificial water-ways of the State, and it may prove an interesting study to decide whether its growth has not been largely or chiefly due to the establishment of the canals, the total abolition of tolls on which is now looked upon with so great aversion.

Of the causes which led to the rapid settlement and development of what we have been accustomed to regard as the Great West, every thoughtful person must regard the establishment of the Erie Canal as one of the most important and far-reaching. Practically bringing the agricultural productions of what are now great and busy States some hundreds of miles nearer tide-water, homes and markets and employments were made for millions of people, without detriment to those located in the East, and to this development the railroads centering in this and other Eastern States are directly or indirectly indebted for the largest share of their business. In any event, certain kinds of freight only can be advantageously served by the slow methods of canal transportation, while the great freight and passenger traffic, which depends upon the existence of the canals for its establishment, must naturally and inevitably tend to swell the volume of railroad business.

Now that it is proposed to bring the Greater West, whose geographical centres lie in Colorado and Dakota, likewise some hundreds of miles nearer tide-water, through the abolition of tolls on the Eastern end of the routes over which a portion of its products must travel on their way to European and other markets, it is for railroad men to consider whether the proposed amelioration of freight charges may not powerfully tend to the creation of a volume of business, compared with which the present volume is insignificant.

Items in the Machinists' Trade.

To say that there is nothing in the machinists' trade but tools and machines, is to say that there is nothing in a well-written book but paper and binding. "What constitutes a good workman?" is a question that cannot be too often asked or too fully answered. The idea that a machinist is only the human embodiment of a certain amount of technical skill in handling tools, is one that few would, perhaps, directly assert in words, but one that many are constantly asserting in action. Such a view is unjust both to the man and the machine, as the one is lowered in dignity, while the usefulness of the other is not increased.

A manufacturing firm in New Jersey make it a practice to retain no man long in their employment who does not show signs of saving money out of the wages paid him. Whatever may be said for or against this kind of paternal government, as applied to shops, it indicates that there is, or ought to be, at least one other thing in the machinist's trade beside tools and machines.

If a machinist aims to systematically widen the range of his reading and thinking, he is liable to find himself confronted with a good many problems that he would never stumble against in his daily work. If consideration of these problems when not at work gives the man an air of greater manliness and steadiness of purpose and reserved force, such as will be likely to aid him in his shop progress, it will at once be noted that here is something more to add to the list of items composing the machinist's trade.

If a machinist can be found, who has no home relations and acts as if he never desired to have them, or who has home relations and acts as if he did not care to have them, the greatest possible technical skill cannot fully make a man of him, and the query whether a man can be a machinist without being a man is here entirely pertinent.

An accomplished physician and surgeon said recently that he was always more at his ease in attending surgical, than in diagnosing and treating medical cases. His explanation was, that in medicine the symptoms were known, and he had to reason backward to find the unknown disease; while in surgery the cause was known, and he had only to reason forward to the cure. If the mechanic is content to take tools which are the product of another man's thought, and use them to produce a finished product *without* thought, that is one thing. If he uses them and knows why he handles them in this or that way, that is quite another. If he can reason back from the finished work to the machine which produces it, that is still another. If any one will demonstrate just where technical skill leaves off and other capabilities begin, in accomplishing this latter result, he will succeed in throwing some light on the questions, "What is the machinist's trade?" and "What constitutes a good workman?"

An adjourned meeting of the Master Car Builders' Association is to be held at Niagara Falls, Oct. 10th, and continue two or more days. A circular signed by the President, L. Garey, and the Secretary, C. A. Smith, requests the attendance of all members.

Observations on Steam Boilers.

The tendency of the general American practice is to use too thin boiler plate in making the shells of steam boilers.

Unless a boiler is made of material of a good respectable thickness, it will be sure to leak and corrode about the seams, and may finally explode. Many instances of this kind are on record. In riveting up the shell, if the iron is too thin, it will be stretched by hammering, and will often buckle so as to crack from the rivet holes to the edge of the sheet.

We were in a boiler shop not long since and noticed several cracks of this description in one boiler where the shell was of thinner iron than it ought to have been. As long as people insist upon buying cheap boilers we shall have to record disastrous boiler explosions.

One of the best ways to clean an upright tubular boiler, or one in which it is impossible to reach all parts of the internal surface to scrape them, and where the water used is liable to form much scale which adheres to the tubes, is to put half a gallon or so of crude petroleum into it a few days before washing out.

This will not cause the boiler to foam, but will effectually loosen the scale, which falls to the bottom. If this dirt is not removed, there is danger of burning the boiler. Every one knows that there is nothing in petroleum that will injure iron, but in a few remote instances we have heard of engineers who complained of their boiler leaking after the petroleum was put into it. The fact was the scale and dirt deposited around the seams inside the boiler were all that kept them from leaking, so that when the dirt was removed the boiler leaked like a sieve. Occasionally a boiler of this kind blows up, revealing the fact that the scale (in some instances over an inch thick) was all that kept the water and steam from escaping.

The objection to using petroleum in boilers then practically amounts to this: *it reveals the fact that many of them are unsafe.* Petroleum was never known to burn a crown sheet or boiler shell, neither has it corroded the seams or pitted the sheets, but, on the contrary, it will prevent many of these curious chemical actions that occur inside of boilers in using certain waters.

Resisting Improved Machinery.

An American firm manufacturing steel pitchforks is reported to have met with some difficulty in its first attempt to export its product to some of the more benighted regions of Europe, owing to the fear on the part of their consignees that trouble with the authorities would be likely to follow, should any of the brigands or turbulent natives use the sharp, polished instruments for other than the peaceful pursuits of agriculture, or, in other words, for fighting purposes. The idea that improvements are not to be applied for fear some one's interest may be damaged, ridiculous as it seems in the instance here mentioned, is not a new one and not confined to districts far removed from the centers of civilization.

When railroads were first being introduced into this country, it was freely predicted that horseflesh would inevitably become valueless. The possibility, since realized, that the new means of transportation would multiply uses for horseflesh that never existed before, and to an extent hardly to be credited, was by such croakers never taken into account.

The idea that improved mechanism in temporarily displacing hand labor, must necessarily be destructive to labor interests, is one that is constantly being entertained and as constantly disproved. Though designed primarily for apparently opposite purposes, the effect of improved machinery is to multiply the uses and prepare the way for the higher employment of labor.

Literary Notes.

The *Northwestern Lumberman* of Chicago, announces a new Directory of the Saw Mills of the United States and Canada. It will appear in a mammoth number of that journal in January, 1883, which will contain, we are informed, 200 pages. That number is also announced to contain the annual review of the white pine lumber and shingle product of the Northwest, also carefully drawn plans, elevations and specifications for the construction of model saw and planing mills, showing all the improvements made in mill architecture, construction and arrangement of machinery with illustrations of improved machines. The Directory will also be published in book form, but its price has not yet been fixed upon.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(356) J. F. W., Jersey City, N. J., asks: When the piston of an engine travels in one direction one-half the revolution of the crank, is that the stroke of that engine? *A.*—Yes.

(357) G. D. P., Chester, Pa., writes: Please inform how I can cheaply make an upright tubular boiler, to run an engine 2½″x4″, 300 revolutions per minute, from a piece of 6″ pipe 20″ long. The pipe is ⅜″ thick, and I want to carry 50 to 75 pounds of steam; and cut-off in engine will be at about one-half stroke? *A.*—You cannot make a boiler of sufficient capacity from a shell of that size. You will need a boiler say 20″ diameter and 3 feet high.

(358) E. H., Glens Falls, N. Y., asks: 1. At what angle with the crank do the steam and exhaust eccentrics of an engine stand? *A.*—The angles vary with engines of different construction, and in different engines of the same general construction. 2. At what part of the stroke is the steam generally cut off? *A.*—At all parts, from 1-16 to ⅞ of the stroke. Probably ¼ stroke is about the average with automatic cut-off engines, and ⅛ with fixed independent cut-off engines.

(359) C. A. B., Owosso, Mich., asks: 1. Can you give me a simple rule for calculating the gears for screw cutting on a lathe? *A.*—See "Screw Cutting on the Engine Lathe," in AMERICAN MACHINIST of August 13 and 20, and October 15, 1881. 2. What is the standard taper for a lathe center? *A.*—The most common standard is 60°. 3. Why is it that in boring two pieces of metal that are clamped together, such pieces for instance as eccentric straps, boxes, etc., they will caliper larger at the joint than elsewhere? *A.*—We suppose you mean why will they caliper larger after being separated. They will not of necessity be larger at the joint. It depends upon the strain brought upon the pieces in clamping, and upon the tendency of the pieces to spring one way or the other when the metal is removed in boring.

(360) C. L., New York City, asks: I. Can the pressure of steam be determined from its temperature, and if so, what is the ratio of increase of pressure to increase of temperature? *A.*—The ratio is not constant. You will find tables of pressure and temperature of steam in books on steam engineering, which, by consulting, will give you the required information. 2. How can the rate of water consumption in a steam engine be ascertained from the indicator diagrams? *A.*—It cannot be so ascertained. 3. What is meant by theoretical clearance? *A.*—We never heard the expression made use of before, and cannot conceive how or why it should be used.

(361) J. R., Glen Rock, Pa., writes: The last dryer in a paper machine is 87 10-16 inches diameter, and the others are 87 13-16 inches. The gear on cylinder is 20 ¾ inches pitch diameter, with 66 teeth. Can we put a new gear on with say 65 teeth, and by so doing increase the surface velocity of the small dryer so that it will be the same as that of the others? *A.*—No. Geared rolls of different diameters to have the same surface speed must have wheels with the number of teeth proportioned to the diameters of the rolls. In this case, since you cannot change your gear by less than one tooth, it is a simple matter of proportion to determine how small the small dryer should be if run with a 65 toothed wheel, to have the same surface velocity as the others run with wheels of 66 teeth. Thus reducing, for convenience, the vulgar fraction 13-16 to its decimal equivalent, the statement is 66:65::87.8125″:86.482″, the diameter the small dryer should be if run with a 65 toothed wheel.

(362) J. L., Cornwall, Ont., sends a sketch representing the path of the crank-pin of a steam engine, together with the connecting rod, cross-head, etc., and asks: Why does the cross-head travel 2 feet 6 inches for 185° of the crank-circle while the other 2 feet 6 inches occupies only 175° of the circle? *A.*—The reason why these spe ial proportions obtain is that the ratio of the length of connecting rod to crank is such as to bring about that result. With different lengths of connecting rod the results will correspondingly differ. The reason why any variation exists is owing to the varying angularity of the connecting-rod, which accelerates and retards the motion of the piston differently at equivalent portions of the forward and return strokes. By dividing the circle representing the crank-pin revolution into quarters, by a line in the direction of the axis, and another one at right angles to it, and using a pair of dividers set to represent the length of the connecting rod, it may readily be seen how and why this irregularity occurs.

(363) E. G., Newark, N. J., asks: Can you give us any simple way of testing oil? Machinists generally are pestered with a great many agents selling oil, one offering his article at a little lower figure than others, and all equally good so they claim. Your reply will give us the information we desire on this subject, we trust. *A.*—As a first precaution to secure good lubricants, deal only with reputable concerns who will guarantee to furnish a uniform quality of oil every time, paying them a fair price which agrees with the standard market quotations. When a drummer comes along and agrees to furnish you a better oil at 15 per cent. less price than you are then paying, you can safely put him down as a humbug. A good test for oil is to place single drops in line upon a piece of plate glass about 8″ wide and 24″ to 30″ long, one end being raised about 6″ to 8″ to form an inclined plane. The drops of oil start from the top of this inclined plane upon a race with each other. The first day sperm oil will be found in the rear, but after a while it will catch up and overtake the rest and will even be found in motion after the other oils have dried up. An oil having a light body runs quickly and dries quickly, but an oil that has both a body and a free flow will readily be detected by this test. An oil may have a good body and yet have a tendency to gum badly, which quality will also be easily detected upon the glass. The oils should be covered from the dust while these tests are being made. A good test for the presence of acids is to put small quantities of oil in copper dishes which are easily made by depressing bits of sheet copper with a round face hammer. If acid is present it will attack the copper and extract the verdigris.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

F. Samuelson, Pattern Maker, 38 Gold St., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Portable Forges, $10. Holt M'f'g Co., Cleveland, O.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

J. M. Badger, Expert and Commission Dealer in Machinery, 5 Dey Street, New York.

Hoerle Bros., Naugatuck, Conn. Small Dies and Special Tools to order.

J. C. Hoadley, Engineer and Expert, 29 High St., cor. Federal, Boston, Mass.

Howard S. Abbot, Solicitor of Patents, 617 7th St., opposite the Patent Office, Washington, D.C.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Pattern Maker's Assistant. By Joshua Rose. 324 pages, $2.50 by mail, postpaid. Address orders, P. O. box 3,306, New York City.

A lot of 25″ lathes designed to equal the best Philadelphia tools, will soon be ready for delivery. Ohl & Co., E. Newark, N. J

Engine Lathes, Speed Lathes, Foot Lathes, Upright Drills, Light Drilling Machines and other fine tools, Frasse & Co., 62 Chatham St., N. Y.

"Steam Economy," 124 pp., cloth, $1.00, by mail, points out remedies for defects in engines. Best indicator practice. A. Wilkinson, 123 n. 4th St. Phila.

Wanted—To sell a Richards' Indicator in good condition. Address, F. G., BOX 1, AMERICAN MACHINIST.

For Sale—A Richards Indicator with three springs, new and complete. Address Indicator, Box 2, office AMERICAN MACHINIST.

Wanted—A complete set of the Journal of the Franklin Institute. Must be in good condition. Address, with price, C. F., Box 7, office AMERICAN MACHINIST.

Wanted—A copy of Willis' Principles of Mechanism. Must be last edition in good condition. Address, with price, A. C., Box 2, office AMERICAN MACHINIST.

Mechanical Engineering.—To learn inventing, designing and construction of machinery at school. Address, S. W. Robinson, Ohio State University, Columbus, O.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users and engineers. [Mention this paper.]

We will pay 25 cents each for copies of the AMERICAN MACHINIST for January 1, 1881, which are clean and in condition for binding. American Machinist Publishing Co., 96 Fulton street, New York.

Wanted to arrange with the right parties for the manufacture on royalty or otherwise, of a first-class automatic cut-off engine. Address, Box 10, care AMERICAN MACHINIST, 96 Fulton street, New York.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

The American Standard of Bolts and Nuts.—A full size drawing of all the bolts and nuts in the system, up to 3 inch. With all the dimensions and number of threads to the inch, in plain figures on each. Also an enlarged section of the thread. Price, $1.00. Sent securely rolled in good order for mounting. Postage prepaid on receipt of price. E. Lyman, C. E., New Haven, Conn.

"Extracts from Chordal's Letters," the most interesting mechanical book published. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 humorous illustrations; 320 pages, 12mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

Rocks, Minerals and Stocks; by Frederick H. Smith, Consulting Engineer and Geologist. Contents: Part I. World Building, Prime Minerals and Rocks, the Formation; Part II. Gold and Silver, Industrial Metals, Coal and Oil, Industrial Minerals, Precious Stones; Part III. Stock Companies, Stock Dealing, Stock Tricks. *A vade mecum* for the use of everyone interested in these important topics. Scientifically accurate, witty, fascinating. *Sui generis* among technical books. Handsomely bound in cloth, $1.50, in paper, 75 cents. Order through your bookseller, or address The Railway Review, 182-184 Dearborn St., Chicago, Ill.

MANUFACTURES.

The old locomotive works at Connellsville, Pa., are to be transformed into a sewing machine manufactory.

Of the $100,000 required to build the projected machine shops in Bath, Me., $90,000 have already been subscribed.

The Porter Manufacturing Co., Hatfield, Mass., have a new shop fitted up for building engine lathes. Their capacity is six lathes a month.

The new Champion Machine Works, at Springfield, O., will have a capacity of one mowing or reaping machine per minute, and employ 2,500 men.

The building of a large structure additional to the Douglas Pump Works, at Middletown, Conn., is progressing very rapidly and will be completed in a few weeks.

O. L. Packard, Milwaukee, Wis., has one of the largest machinery depots in the West. During the last season his business has increased so rapidly that he has added a stone building 25 x 100 feet.

The new Hoosier Saw Works, at Indianapolis, are completed and in full operation. The works are of brick, two stories in height, occupying an area of 140 x 140 feet. W. H. Barry is the proprietor.

The new repair shops of the E. & N. A. railway at Mattawamkeag, Me., are completed, and the machinery is now being moved in. The structure is of large size, built of brick and substantially constructed.

Gov. Howard and Pardon Armington, of the Armington & Sims Co., Providence, R. I., have started for Europe on business connected with Armington & Sims' engine. The right to build the engine in France has been sold.

Henry Billings, president; R. P. Snelling, treasurer; the same, Louis Arnold and R. P. Daly, directors, have organized as the Pettee Machine Works of Newton, Mass., with a capital stock of $200,000, for the purpose of manufacturing and selling machinery.

Sargent & Co., New Haven, Conn., who employ 2,000 hands in the manufacture of hardware, have made a reduction of 10 per cent. in the wages of their employes owing to the large shrinkage in the market price of goods. Unless prices go up within a month the employes are given to understand that the reduction will be made 15 per cent.

The city of Henderson, N. C., is moving onward. A cotton mill, with $300,000 capital, has been recently incorporated, and nearly all the stock taken. A wagon factory, with a capital of $100,000, is being talked up; a large foundry is contemplated, and a hominy mill is going ahead with a large capital stock already taken.

Williamson & Barker, of Grand Crossing, Ill., are to build at once, in connection with their foundry, a machine shop 60x70 feet. A large amount of machinery will be added to this department for finishing up castings, and the firm will do a general machinery business. With these improvements their facilities will be increased fully 50 per cent.

The Illinois Iron & Bolt Company, of Carpentersville, have recently improved the machinery in their works for making jack screws which are of their own patent, and which enables the company to produce a cheap and safe screw. The additions to the works are about completed, including a number of buildings for employes.—*Chicago Industrial World.*

The firm of Samuel Reid & Co., proprietors of the Columbian Brass Works, Chicago, is to be changed to a joint stock company, with a capital of $30,000 under the title of the Reid & Thayer Co. The incorporators are: Samuel Reid, John C. Thayer, Charles W. Parker and Wm. Baragawanath. This company will manufacture the new Reid & Thayer lubricators and will do a general brass manufacturing business.

Council Bluffs, Iowa, will have a $35,000 jail. (Under equitable laws for mechanics and other citizens this item could not properly be placed in our department of "Manufactures," but as jails, prisons and penitentiaries have become manufacturing establishments and are made to squeeze free labor by unjust competition in order to enrich a few favored contractors, the item belongs in this part of the paper.)

McEntee & Dillon, Rondout (N. Y.) Iron Works, are building a 20″ x 22″ condensing engine for a steamboat for Harry Hill. They have a large number of orders for boilers, and are employing 100 hands, which force will soon be increased to 125. They have just completed a 22″ x 24″ engine for the People's Line. It goes into a tug-boat, to be used for helping the large steamboats through the bridges at Albany.

A company is being formed, of which Joseph A Smith of New Haven, Conn., will be president and business manager, for the manufacture and sale of the Trowbridge coil boiler. The company will probably be known as the Automatic Boiler & Engine Co., and will occupy temporary manufacturing quarters at Birmingham, Conn., the present idea being to build extensive works at Shelton, Conn., just across the Housatonic River from Birmingham.

A sheet metal can, patented by Edwin Norton, of Norton Brothers, tinware manufacturers, Chicago, has the combination, with the can body provided with an interior shoulder, of a seamless flange having its inner edge folded over and soldered to the interior shoulder, and its outer edge folded, with the cover, into a double seam.

Duncan & Baldwin, stove manufacturers of Pittsburgh, Pa., have purchased a large lot in Newcastle that State, where they propose erecting a foundry, 200 x 100 feet; a finishing shop and warehouse, 175 x 50 feet, and four stories in height, besides all the other storehouses, sheds, outbuildings, etc., necessary to a complete establishment of the kind. The buildings are to be of brick and stone, built in the most substantial manner. They will employ probably 150 hands.

R. H. & C. M. Avery, manufacturers of corn planters, who have removed from Galesburg to Peoria, Ill., are building entirely new works of brick, 150x150, and three stories. This building will be used as a wood shop, paint shop, machine shop, and warehouse. Across the railroad are other buildings about 400x40 feet, for blacksmith shop and grinding room. The machinery is already in these buildings and the engine running. About $50,000 worth of the latest improved machinery will be placed in these works including a battery of four boilers, 30-horse power each, besides two engines, one 30-horse power, the other 80-horse power. One hundred and fifty to two hundred men will be given employment in these works, which are expected to start up within 60 days. The works cover 10 acres.

The Staunton Iron Works, of Staunton, Va., have been bought by Messrs. Nelson, Beall and Paul, of Frostburg, Md., for $16,500 cash. The new firm is said to have large capital, and will at once proceed to the enlargement of the present works, and the erection of car shops near the Chesapeake & Ohio railroad. They propose to enter largely into the manufacture of iron generally, paying special attention to car trucks and wheels, narrow gauge locomotives, engines, boilers, saw mills and the like. They will also manufacture the "Paul Patent Radiator," an invention said to be capable of generating about double the heat usually secured from radiators of the same size and cost.

The Burlington Plow Company, of Burlington, Iowa, is the name of a newly incorporated company with a capital of $50,000, for the manufacture of cultivators and plows. Their new works which are now in course of erection, will occupy 2½ acres. The main building will be 40x90, 3 stories brick and attic, blacksmith shop 40x50, wareroom 30x40 and other smaller buildings. The buildings are being built very substantially, the foundations are to be concrete, basement heavy stone and the roof heavy tile. The officers of the company are: E. D. Rend, president; J. B. Neff, vice-president; S. S. Tuttle, secretary; E. F. Tuttle, treasurer; Geo. P. Heberling, superintendent. They expect to have the works in running order as early as Dec. 1st and employ from 50 to 75 men. $7,000 worth of the very best new and improved machinery will be added to the works. The company have already on their books an order for $20,000 worth of their goods.

The Atlanta *Constitution*, in reviewing the progress of that city during the past year, says: In nothing has Atlanta made such progress as in her manufacturing interests. Beside the Fulton County Cotton Mill, which started operations within the current year, and employs about 400 operatives, the Exposition Mills, which will employ quite as many more, are now receiving their machinery. The Haiman Plow Works have been increased during the year from the need of 150 hands to 700, and the capacity doubled five times over. The Clarke Cotton-Seed Cleaner Company, which manufactured 600 machines last year, manufactures this year 2,500, and will arrange to double this next year. Wilkins & Post, bridge builders, are erecting machine shops and foundries that will cover several acres of ground. Another cotton compress, costing over $50,000, has been erected with ample warehouses and other buildings necessary. A company has been organized with a capital of sixty thousand dollars to manufacture the Globe cotton planter. All of the stock has been taken, the capital paid in and the work on the buildings commenced. This factory, when completed, will employ a large force of workmen. A cotton-seed oil mill with a capital of $100,000 has been built; an oleomargarine factory with a capital of $500,000 has been started and will become one of the most extensive enterprises in the South. A company has been formed for the establishment of union stock yards, with hotels, and with extensive machinery for slaughtering cattle, the manufacturing of oil and the packing of pork. The East Tennessee, Virginia and Georgia Railroad is erecting shops that will do the repairing and building for nearly six hundred miles of the road and give employment to several hundred first-class mechanics. The Air Line Shops, with quite an extensive reach of road to supply and quite as many hands, have been finished during the year. Besides these there are numberless smaller industries, such as the broom factory, match factory, ax-handle factories, &c., that cannot be enumerated, and many important ones that escape attention at the moment. The completion of the Georgia Pacific Road to Anniston, which is assured within the next few months, will give Atlanta manufacturers coal at a cost not exceeding three dollars a ton, and has given great impetus to manufacturing enterprises, and many very important companies are being formed for the establishment of various sorts of factories and shops.

Machinists' and Engineers' Supplies.

New York, Oct. 5, 1882.

The export trade in supplies continues without interruption, but the domestic orders have fallen off considerably. There is still a fair amount of business being transacted but the orders are mostly small, to meet temporary wants. There seems to be no apprehension that prices will advance in the near future, hence the consumers continue to view this situation with indifference. Some of the dealers seem to have a strong faith that business will again revive as the colder weather approaches. Prices are unchanged.

Wrought Iron Pipe is growing more scarce, but the price remains unchanged at 57½ per cent. discount from list, notwithstanding several sizes are practically out of the market.

Iron and Metal Review.

There is not much activity in the Pig Iron market at the present time and the light demand is confined to the standard brands. Consumers manifest no intention of laying in a stock and appear to have full confidence that prices will be lower.

The present indications are that future prices will favor the buyer and manufactured iron already shows an easy tendency. We quote prices as follows: Foundry, No. 1, $26 to $26.50; Foundry, No. 2, X, $24 to $24.50; Grey Forge, $20.50 to $21.50. The market for Foreign Iron remains quiet but firm. Buyers are holding off and dealers are demanding higher prices in consequence of the advances upon the other side. We quote prices as follows: Coltness, $27.50 to $28; Glengarnock, $25.50 to $26; Gartsherrie, $26.25 to $26.50; Summerlee, $26.50; Carnbroe, $24.50; Eglington, $23.50 to $24; Langloan, $26 to $26.50. Wrought Iron Scrap is in moderate demand at $29 from yard. Iron and Steel Rails same as last reported. Old rails quiet but steady at $27 for Tees, and double-heads at $30.50. Consumers of Merchant Iron have been protecting themselves freely for several weeks past, the result of which has been a falling off in the demand until the Western mills have caught up to present requirements. The card rates are 2.6 cents, country mills 2¼ cents, store price 2.7 cents. All the mills are reported full for six weeks to come.

Copper is in moderate demand at 18c. to 18¼c.; Banca Tin, 28c; Straits and Malacca 25c. to 25¾c.; Billiton, 25¾c. to 26c.; Australian, 25c to 25⅛c.; English Lamb and Flag, 24¾c. Spelter, 5.50c. to 5.65c. for Western Common; Refined, 8c. to 8¾c.; Silesian, 5.50c. to 5.65c. Lead, Common, 5.15c. to 5.20c.; Refined, 5.20c.; Antimony, Hallett's brand 10¾c. to 11c.; Nevada, 12½c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue

Wanted—A situation by a thoroughly competent engineer and machinist. Will take charge of one or more large automatic cut-off engines. Address, Wm. M. Harrison, Glens Falls, N. Y.

Mechanical draughtsman with first-class references, experienced in gas works and general machinery, also civil engineering, is open for engagement. Address, Box 9, care American Machinist.

A man of experience with steam engines and general jobbing, wants a situation to take charge of work. Correspondence solicited. Address, Box 503, Defiance, O.

Thorough machinist of great European and American experience, wants position as traveler or salesman; would take charge of work here or abroad. Address Abstainer, this office.

To Capitalists.—A leading draughtsman and superintendent wishes to meet with suitable opening. Could introduce new lines of business if required; accustomed to engines, steam cranes, tools, &c. Address, Philada, care American Machinist.

Wanted—A machinist able to manage a small jobbing shop running on light fine work, may buy an interest in an established and well located shop, or the whole will be sold. S. McHenry, 927 Filbert St., Phila.

Wanted—By a mechanic who has a large machinery correspondence on a line that is in constant demand, some machine shop to manufacture for him Can give employment to 20 or more men. For particulars address, Thos. Rich, Lock-box 259, Lockport, N. Y.

Wanted—A machinist fully competent to build steam engines and general machinery and willing to invest a few thousand dollars as an earnest of his ability. The capitalist and out-door man of a firm engaged as above, in the immediate vicinity of New York, desires to make a change. Plenty of work and orders ahead. Will entertain no proposition unless parties joining have capital to invest and which they are willing to risk on their ability. Address, appointing interview, "Dexter," care American Machinist.

Wanted—500 feet of 42-inch diameter old boiler shells. Address, P. O. Box 1208, New Haven.

Wanted—A horizontal steam boiler, 60 to 80 horse power. Second-hand or new. Address, giving fullest particulars, T. D. P., American Machinist, 96 Fulton street, New York City.

Second Annual Exhibition Fair
OF THE
New England Manufacturers' and Mechanics' Institute
IS NOW OPEN IN BOSTON.
The largest exhibition building in the United States. Ten acres of industrial exhibits, displaying the wonders of mechanism, Science and Art. The largest display of Machinery since the CENTENNIAL, all in operation, and showing the processes of manufacture **Carpet Weaving, Cotton Weaving, Silk Weaving.** The great railroad display of Atlanta duplicated. The leading industries of the North, South, East and West fully displayed, making a NATIONAL EXHIBITION.
DON'T FAIL TO VISIT THE EXHIBITION FAIR.

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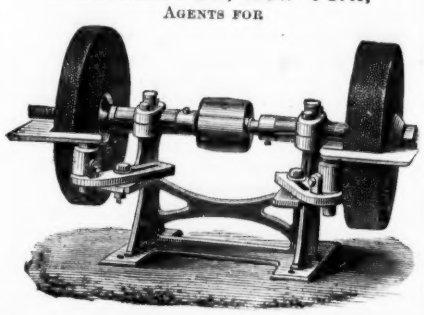
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Our wheels possess superior cutting qualities, combined with great durability. Eureka Plow Polisher and Patent Stove Plate Grinders.

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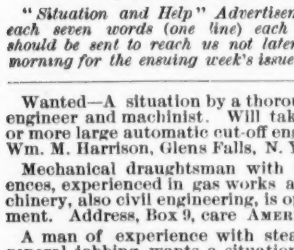

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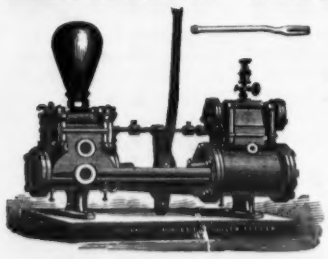
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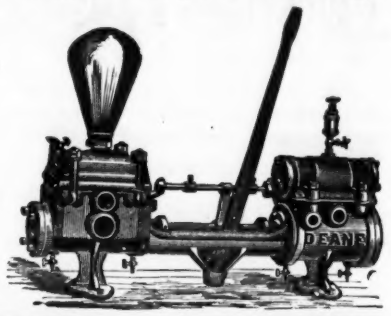

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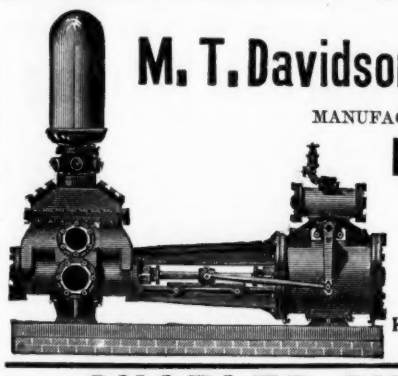
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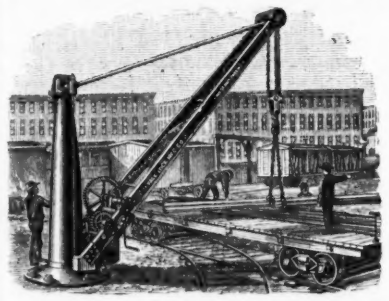
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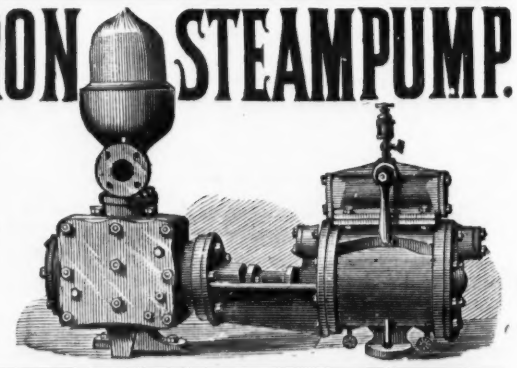

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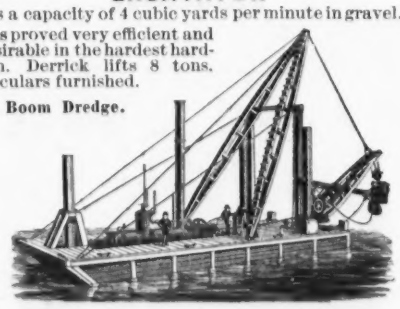
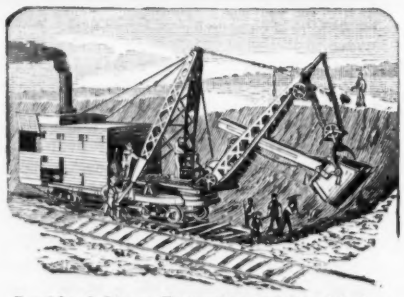
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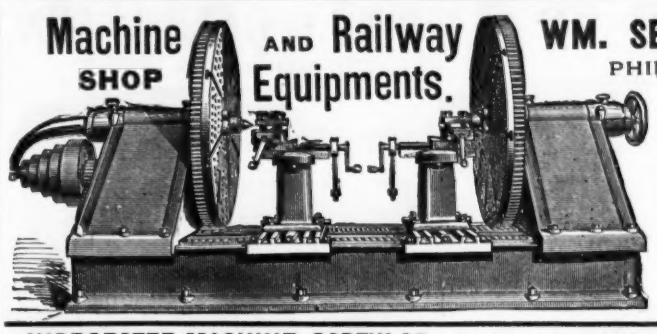

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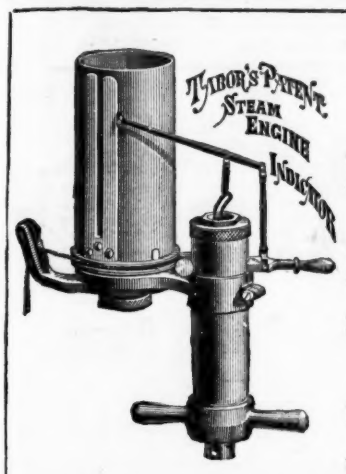

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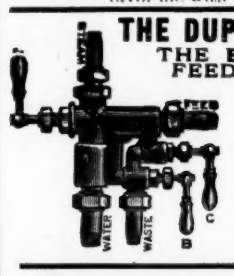

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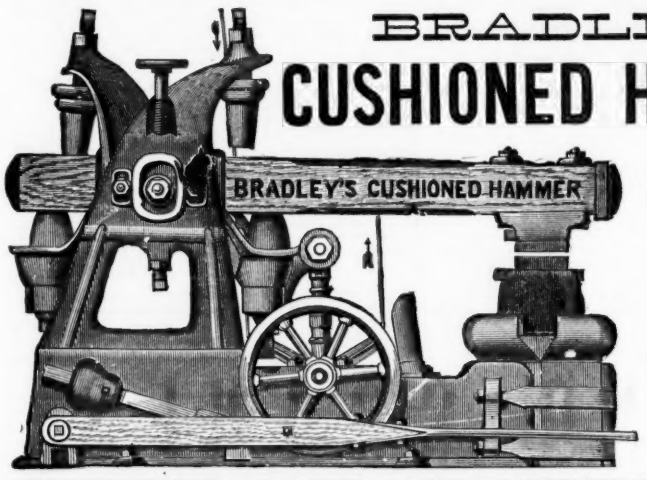

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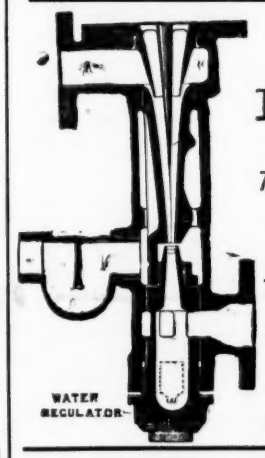

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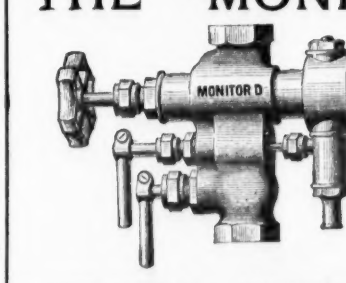

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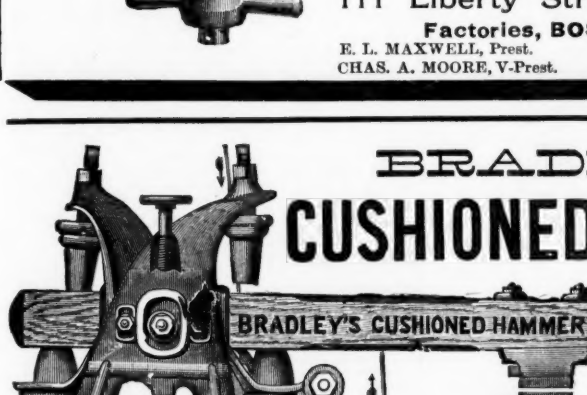

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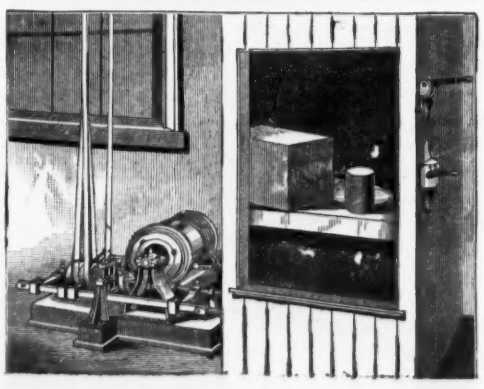

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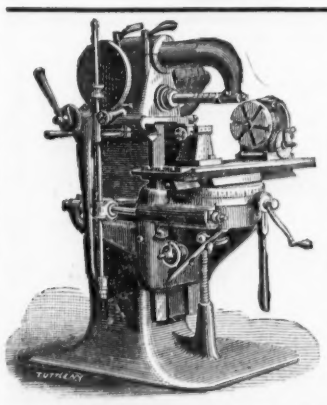

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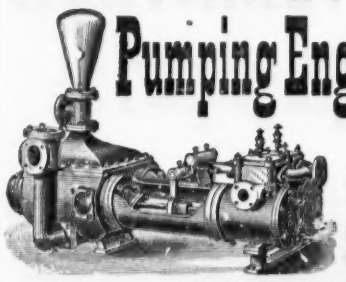

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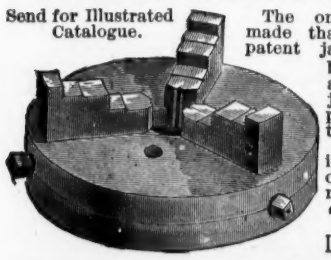

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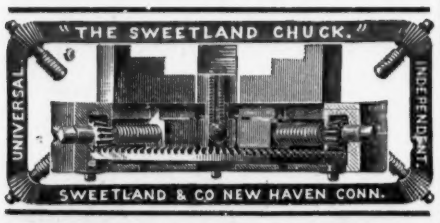

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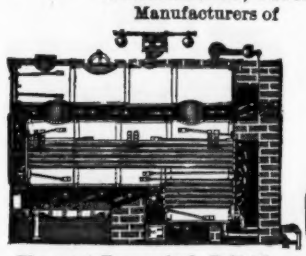

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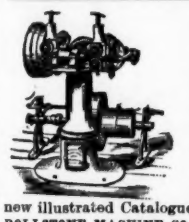

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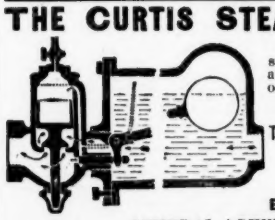

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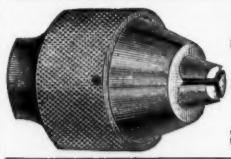

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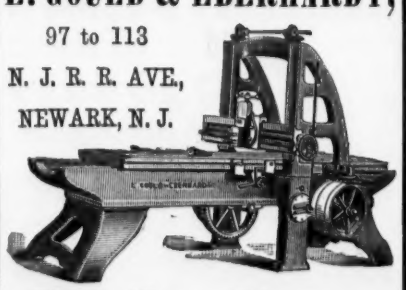

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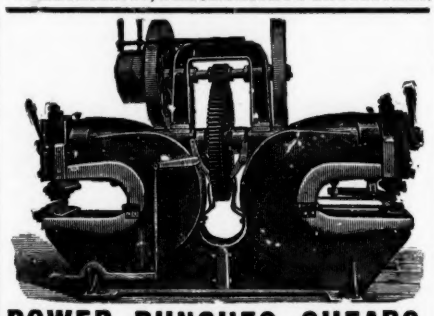

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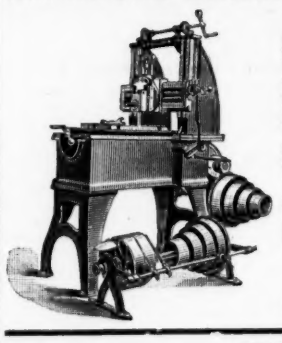

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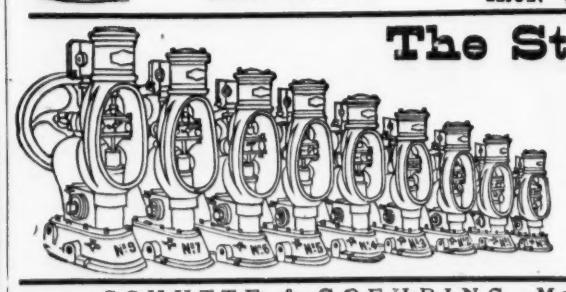

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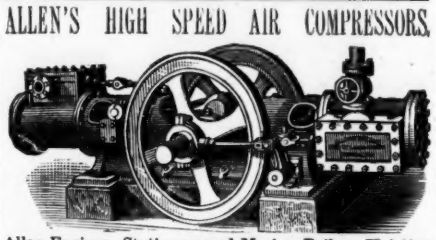

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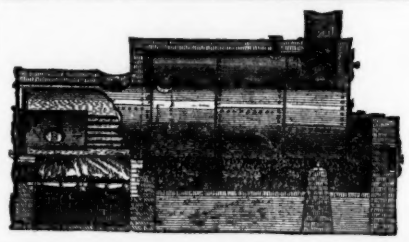

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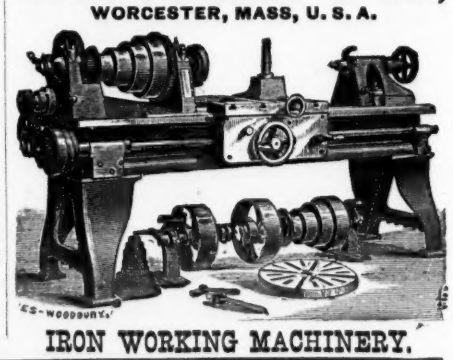

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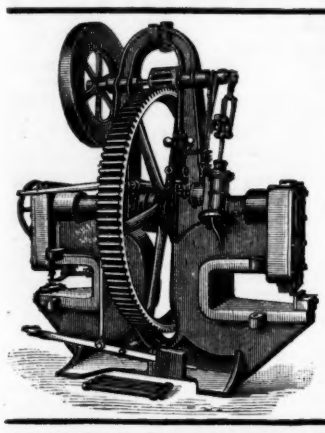

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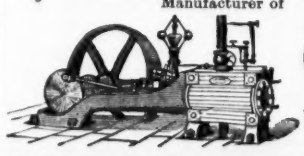

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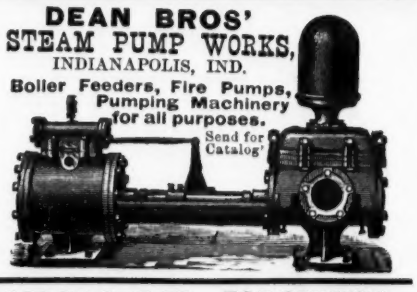

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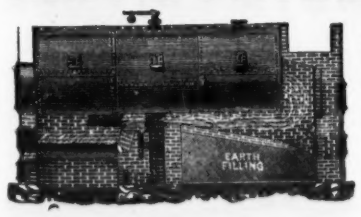

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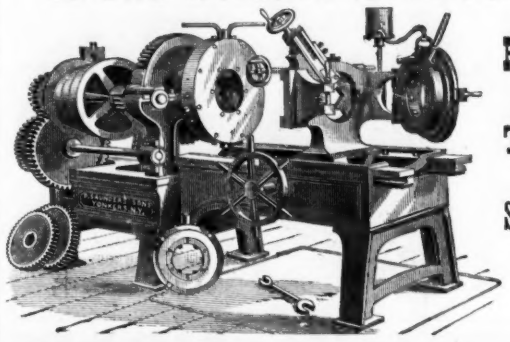

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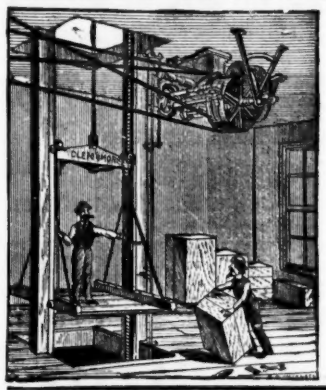

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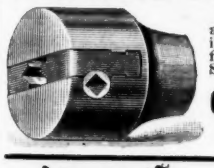

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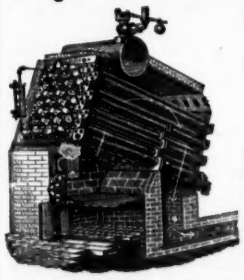

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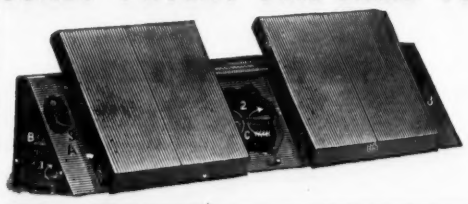

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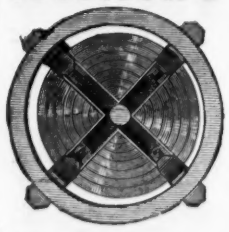

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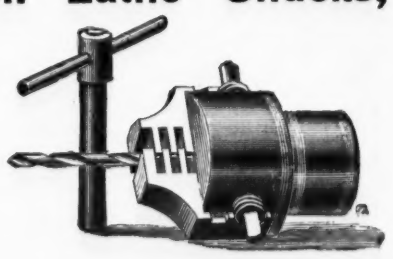

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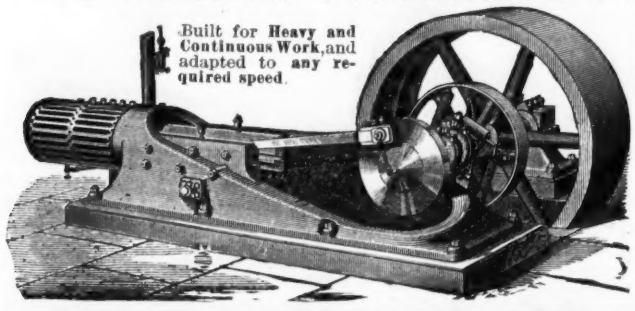

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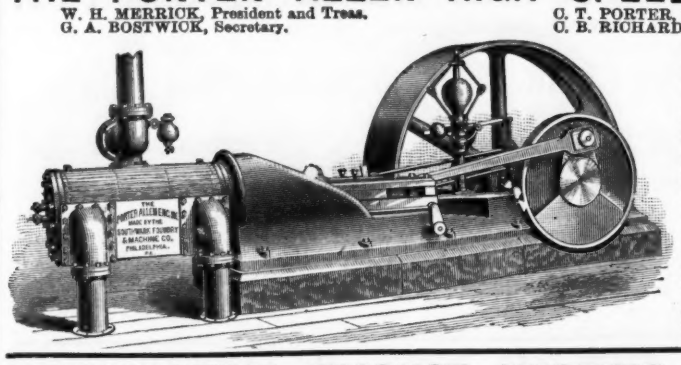

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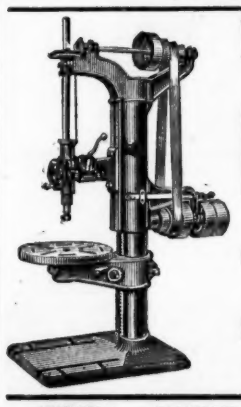

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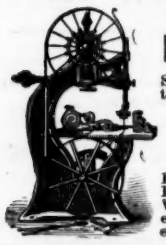

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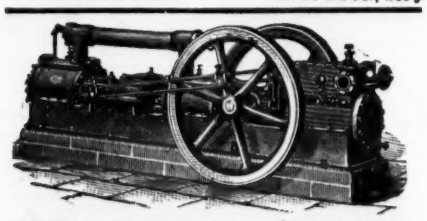

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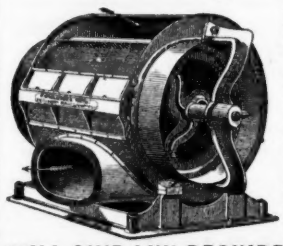

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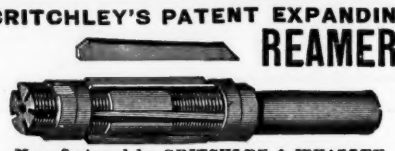

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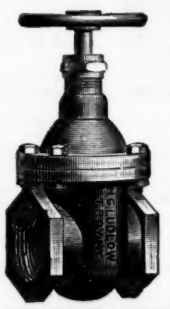

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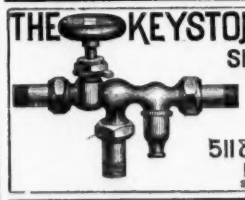

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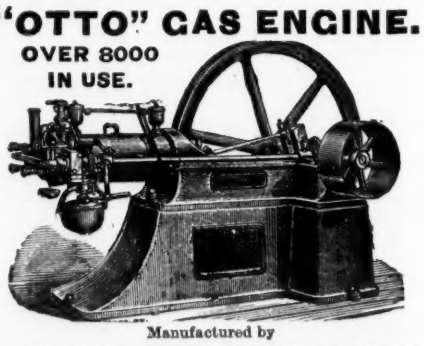

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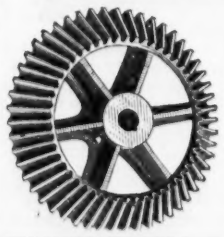

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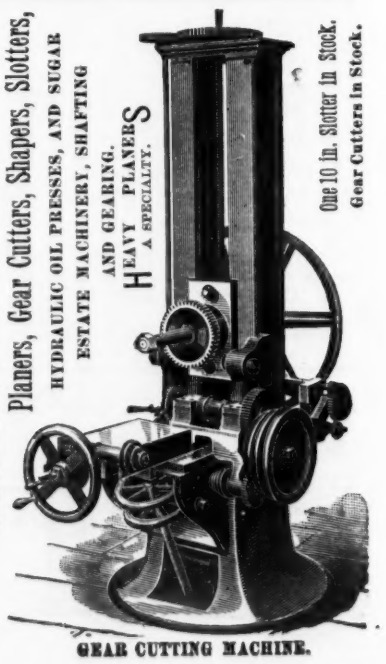

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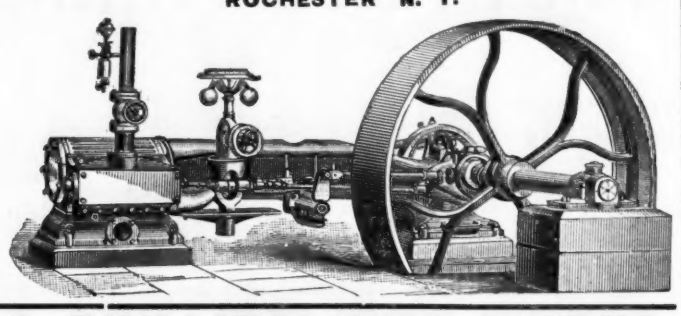

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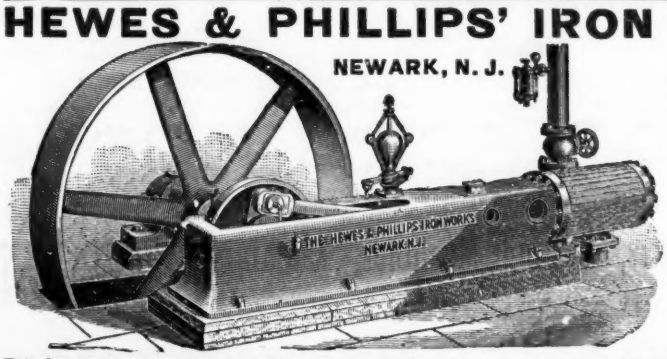

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24 " "	14 and 16	"	Fitchburg.
21 " "	12 and 14	"	Blaisdell.
20 " "	14	"	Fitchburg.
20 " "	12	"	Fifield.
19 " "	10 and 12	"	Gray.
18 " "	10 and 12	"	Blaisdell.
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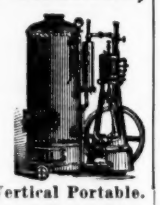

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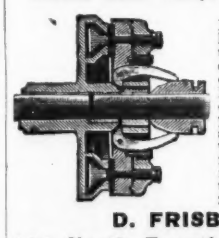

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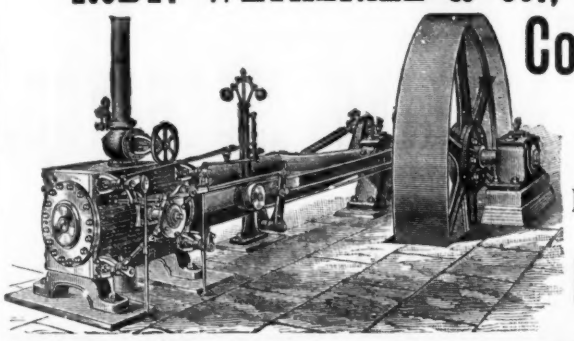

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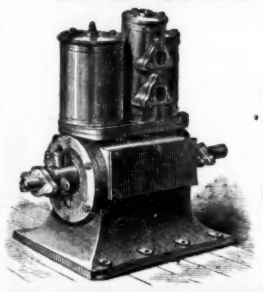

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1	16 in. Upright Drill.	"
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1	24 in. "	Prentiss. New.
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1	25 in. swing B.G. & S. F. Drill.	Blaisdell.
1	28 in. " " "	"
1	15 in. Shaper.	Gould & Eberhart. "
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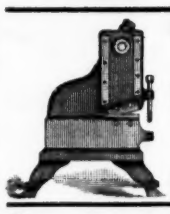

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Taft's Patent.

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1	30 in. " 16 ft. "	" " " Oct 20
1	30 in. " 14 ft. "	" " " Oct 10
1	26 in. swing, 14 ft. bed.	Oct. 20th.
1	32 in. x 8 ft.	Planers. New. Oct. 10th.
2	12 in. stroke Slotting Machines.	New. Oct. 10.

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1	42 in. swing, 16 ft. bed,	New Engine Lathe.
1	New Corliss Engine.	50 horse power.
1	22 in. swing, 11½ ft.	Bed Engine Lathes. New.
2	22 in. " 12 ft.	" " "
1	19 in. " 8 ft.	" " "
2	18 in. " 8 ft.	" " "
1	17 in. " 10 ft.	" "
5	15 in. " 6 ft.	" " "
1	12 in. swing, 6 ft.	Hand Lathe. New.
1	10 in. " 4½ ft.	Bed Hand Lathe. New.
1	38 in. x 10 ft.	Planer. New.
1	38 in. x 12 ft.	Planer. New.
2	30 in. x 8 ft.	Planers. New.
1	26 in. x 7 ft.	Planer. New.
1	26 in. x 5 ft.	" "
1	22 in. x 4 ft.	Planer. New.
2	38 in.	Swing Upright Drills. B. G. & S. F. New.
1	26 in.	Drill. B.G.&S.F. New.
1	23 in.	Drill. B. G. & S. F. New.
1	23 in. "	Plain.
3	20 in. "	"
1	18 in.	Bench Drill.
1	4 spindle	Drill. New.
1	3 "	" "
2	4 "	" Second-hand.
1	Wall Drill, heavy.	Second-hand. 60 in
2	12 in.	Shapers. New.
2	15 in. "	"
2	12 in. stroke Shapers, traveling head, 40 in traverse double tables.	New.
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3	Double-Acting Presses, No. 3,	nearly new.
4	Single-Acting Presses, for power,	"
100	Foot Presses,	nearly new.
2	Small Power Punching Presses.	Second-hand.
1	Foot Punch, with bench.	New.
1	Lot Pistol Machinery.	Second-hand.
	Lot of Forges 1 Railway Saw Bench, 1 Foot-power Circular Saw.	
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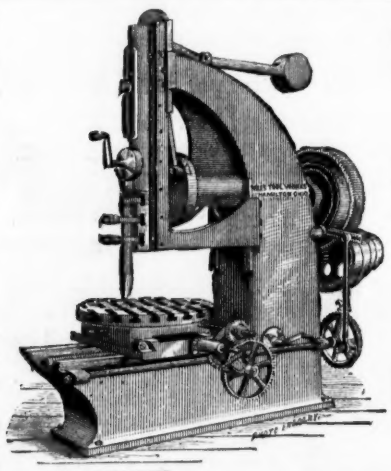

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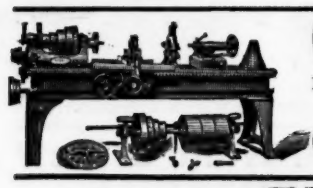

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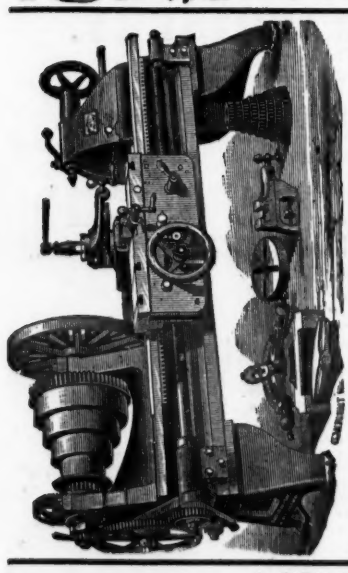

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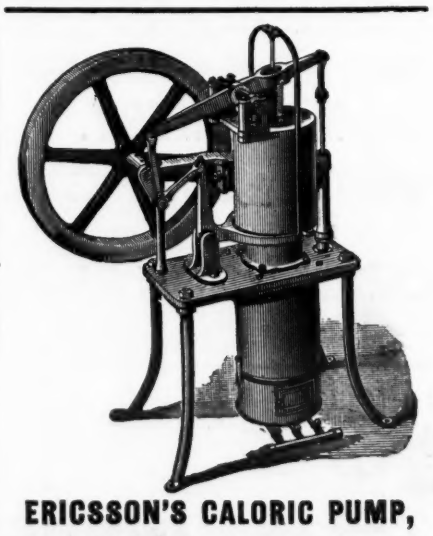

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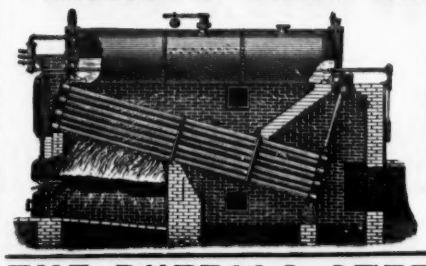

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